Case 1

2 to 20 years: Girls
Stature-for-age and Weight-for-age percentiles

<table>
<thead>
<tr>
<th>Mother’s Stature</th>
<th>Father’s Stature</th>
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<tr>
<td>Date</td>
<td>Age</td>
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*To Calculate BMI: Weight (kg) = Stature (cm) + Stature (cm) x 10,000
or Weight (lb) = Stature (in) + Stature (in) x 703

NAME J. G.  
RECORD # case 1

SOURCE: Developed by the National Center for Health Statistics in collaboration with the National Center for Chronic Disease Prevention and Health Promotion (2000). 
http://www.cdc.gov/growthcharts
Case 1—J.G. is an 11 year old girl who has always been “short for her age.” Her mother is 5’0”, her father is 5’5”. Her physical exam is normal, and her breasts are Tanner II, pubic hair is Tanner II.

1. What should you do next? (Select as many as apply.)
   e) calculate mid-parental height
   f) obtain bone age
   g) laboratory screening
   h) re-plot on a specialized growth chart

2. The most likely diagnosis is (select one answer):
   e) familial short stature
   f) constitutional delay
   g) Turner Syndrome
   h) Down Syndrome
GROWTH CURVES OF HEIGHT BY AGE FOR BOYS
(Average, Accelerated, and Retarded Rates of Maturation)

Case No. ..............................................

Inches

Centimeters

INCREMENT CURVE

Centimeters

Inches
Case 2c

GROWTH CURVES OF WEIGHT BY AGE FOR BOYS
(Average, Accelerated, and Retarded Rates of Maturation)

Case No.:____________________________

Years 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21

Kilograms 0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100

Pounds

INCREMENT CURVE
Case 2—B.T. is a 12 year old boy who has always been shorter than his peers. His mother is 5'1", and his father is 5'6". His mother had menarche at age 15 years; his father had late pubertal development. His physical examination is unremarkable, with pubertal development Tanner I.

1. What should you do next? (Select as many as apply.)
   e) calculate mid-parental height
   f) obtain bone age
   g) laboratory screening
   h) re-plot on a specialized growth chart

2. The most likely diagnosis is (select one answer):
   f) skeletal dysplasia
   g) constitutional delay
   h) growth hormone deficiency
   i) Turner Syndrome
   j) chronic disease
Case 3b-Turner Girls: Physical Growth, 2 to 19 years
Case 3—S.T. is an 11 year old girl with short stature and history of recurrent otitis media. Her mother is 5’4”, and her father is 5’9”. Her physical exam is remarkable for multiple nevi, low posterior hairline, webbed neck, widely spaced nipples, and increased carrying angle. Her breast and pubic hair development are Tanner I.

1. What should you do next? (Select as many as apply.)
   e) calculate mid-parental height
   f) obtain bone age
   g) laboratory screening
   h) re-plot on a specialized growth chart

2. The most likely diagnosis is (select one answer):
   f) skeletal dysplasia
   g) constitutional delay
   h) growth hormone deficiency
   i) Turner Syndrome
   j) chronic disease
Case 4—B.H. is an 8 year old boy who has always been shorter than his peers. His review of systems is negative. He has been generally healthy. His mother is 5’4”, his father is 5’9”. On physical exam, he has a “cherubic” appearance. His phallus is 4.5 cm (<10th percentile), and his upper to lower segment ratio is 1.0. His physical exam is otherwise unremarkable.

1. What should you do next? (Select as many as apply.)
   e) calculate mid-parental height
   f) obtain bone age
   g) laboratory screening
   h) re-plot on a specialized growth chart

2. The most likely diagnosis is (select one answer):
   f) skeletal dysplasia
   g) constitutional delay
   h) growth hormone deficiency
   i) Turner Syndrome
   j) chronic disease
Case 5—B.B. is a 30 month old male whose length percentile is decreasing. He was the 8 lb. 20½ inch product of a full-term gestation delivered vaginally without complications. His past medical history is significant for a few upper respiratory infections, but he has been otherwise healthy. His mother is 63”, his father is 68”.

1. What should you do next? (Select as many as apply.)
   e) calculate mid-parental height
   f) obtain bone age
   g) laboratory screening
   h) re-plot on a specialized growth chart

2. The most likely diagnosis is (select one answer):
   f) constitutional delay
   g) hypothyroidism
   h) non-organic failure to thrive
   i) channeling (i.e., normal variant)
   j) skeletal dysplasia
Case 6b-Girls with Down Syndrome
Case 6—G.C. is an 11 year old girl who has always been short and is developmentally delayed. Her past medical history is notable for a ventricular septal defect and recurrent otitis media. Her mother is 5’5”, her father is 5’10”. Her physical exam is notable for abnormal palpebral fissures and palmar creases, a protruding tongue, and a short neck. Her breast and pubic hair development are Tanner II.

1. What should you do next? (Select as many as apply.)
   e) calculate mid-parental height
   f) obtain bone age
   g) laboratory screening
   h) re-plot on a specialized growth chart

2. The most likely diagnosis is (select one answer):
   e) familial short stature
   f) constitutional delay
   g) Turner Syndrome
   h) Down Syndrome
Case 7—K.A. is a 13 year old boy with short stature and pubertal delay. His past medical history is significant for a seizure disorder and developmental delay. His medications include Depakote, Phenobarbital, Neurontin, and Diamox. His review of systems is positive for a restricted diet; he likes only potato chips. He denies abdominal pain or diarrhea. His mother is 5’5”, his father is 5’10”. His physical exam is notable for a gaunt appearance. He has 5 cc testes and Tanner II pubic hair.

1. What should you do next? (Select as many as apply.)
   f) calculate mid-parental height
   g) obtain bone age
   h) laboratory screening
   i) re-plot on a specialized growth chart
   j) other

2. The most likely diagnosis is (select one answer):
   e) constitutional delay
   f) hypothyroidism
   g) malnutrition
   h) channeling (i.e., normal variant)
   i) skeletal dysplasia
Case 8a

2 to 20 years: Girls
Stature-for-age and Weight-for-age percentiles

<table>
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<tr>
<th>Date</th>
<th>Age</th>
<th>Weight</th>
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<th>BMI*</th>
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*To Calculate BMI: Weight (kg) = Stature (cm) + Stature (cm) x 10,000
or Weight (lb) = Stature (in) + Stature (in) x 703

NAME: K.R.
RECORD #: Case 8a
Case 8b

2 to 20 years: Girls

Stature-for-age and Weight-for-age percentiles

<table>
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<tr>
<th>Age</th>
<th>Weight</th>
<th>Stature</th>
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</table>

**To Calculate BMI:**

- Weight (kg) = Stature (cm) - Stature (cm) x 10,000
- Weight (lb) = Stature (in) - Stature (in) x 703


SOURCE: Developed by the National Center for Health Statistics in collaboration with the National Center for Chronic Disease Prevention and Health Promotion (2003).

http://www.cdc.gov/growthcharts
Case 8—K.R. is a 6 and 1/2 year old girl presenting with fatigue. Her review of systems is positive for cold intolerance, dry skin, and constipation. Her physical exam is remarkable for a sallow appearance, waxy dry skin, and coarse hair. Her mother is 5’2” and her father is 5’7”.

1. What should you do next? (Select as many as apply.)
   e) calculate mid-parental height
   f) obtain bone age
   g) laboratory screening
   h) re-plot on a specialized growth chart

2. The most likely diagnosis is (select one answer):
   f) constitutional delay
   g) hypothyroidism
   h) non-organic failure to thrive
   i) channeling (i.e., normal variant)
   j) skeletal dysplasia
Case 9—G.F. is a 17 year old girl who has been overweight “for as long as I can remember.” Her family history is positive for obesity on both the paternal and maternal sides of the family. Her dietary history is notable for erratic eating habits and skipping meals; she has a high intake of fat and concentrated sweets. She has regular menses. Her breast and pubic hair development are Tanner V.

1. What should you do next? (Select as many as apply.)
   f) calculate mid-parental height
   g) obtain bone age
   h) laboratory screening
   i) re-plot on a specialized growth chart

2. The most likely diagnosis is (select one answer):
   e) precocious puberty
   f) growth hormone excess
   g) obesity
   h) Cushing’s syndrome
Case 10

2 to 20 years: Girls
Stature-for-age and Weight-for-age percentiles

<table>
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<th>AGE (YEARS)</th>
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Mother's Stature
Father's Stature

<table>
<thead>
<tr>
<th>Date</th>
<th>Age</th>
<th>Weight</th>
<th>Stature</th>
<th>BMI*</th>
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*To Calculate BMI: Weight (kg) = Stature (cm) x Stature (cm) x 10,000
or Weight (lb) = Stature (in) x Stature (in) x 703

SOURCE: Developed by the National Center for Health Statistics in collaboration with the National Center for Chronic Disease Prevention and Health Promotion (2000), http://www.cdc.gov/growthcharts
Case 10—A.B. is a 4 and 9/12 year old girl who developed breast buds at age 3 and 10/12 years. Height acceleration was noted from the age of 4 years. Pubic hair development and apocrine odor were noted at age 4 and 6/12 years.

1. What should you do next? (Select as many as apply.)
   e) calculate mid-parental height
   f) obtain bone age
   g) laboratory screening
   h) re-plot on a specialized growth chart

2. The most likely diagnosis is (select one answer):
   f) tall stature
   g) precocious puberty
   h) growth hormone excess
   i) obesity
   j) Cushing’s syndrome
Systemic Disorders That Affect Growth

- **Malnutrition**
- **Renal disease**
  - Growth failure secondary to rickets, acidosis, and nutritional failure
  - Resistance to GH
- **Diabetes**
  - Poor control, with significant acidosis, will result in significant growth retardation
- **Cardiac**
  - Growth failure may be due to cyanosis and hypoxia
  - Other unclear underlying mechanisms
- **Hematologic disease**
  - Chronic anemias
- **Gastrointestinal disorders**
  - Inflammatory bowel disease
  - Chronic liver disease
  - Celiac disease
  - Other causes of malabsorption
- **Respiratory disease**
  - Cystic fibrosis
  - Asthma
- **Endocrine disorders**
  - Hypothyroidism
  - Growth hormone deficiency/inadequacy
  - Cortisol excess
- **Congenital Disorders**
  - Intrauterine growth retardation
  - Skeletal dysplasia
  - Other genetic syndromes (e.g., Turner’s Syndrome)
**Understanding Growth: Normal vs. Abnormal Patterns**

**Bibliography:**

1. *Monitoring and Assessment of Growth, The Primary Care Perspective [slide series]*. Genentech, Inc.

**Short stature**

**Hypothyroidism**

**Obesity**

**Precocious puberty**

**Suggested Reading (Annotated)**


**Educational Resources on the World Wide Web**

*The National Center for Health Statistics*
http://www.cdc.gov/nchswww/ (Home page)
http://www.cdc.gov/growthcharts/ (Growth charts)