Accurately Weighing and Measuring Infants, Children and Adolescents

Cristine M Trahms, MS,RD,FADA
Department of Pediatrics,
Center on Human Development and Disability
University of Washington

Objectives

- To describe accurate techniques for measuring weight, length and head circumference for infants and weight and stature for children and adolescents.
- To describe alternative techniques for estimation of stature and body composition

Training in correct techniques for weighing and measuring children and the correct use of growth charts form the backbone of nutritional assessment of infants and children.

- George Christakis, Nutritional Assessment in health Programs, American Journal of Public Health, 1973

Measuring Up: It's Not a Small World After All

Newsweek, 5/11/1998

How are the measurements used?

- Accurate and reliable physical measures are used to:
  - Monitor the growth of an individual
  - Detect growth abnormalities
  - Monitor nutritional status
  - Track the effects of medical or nutritional intervention

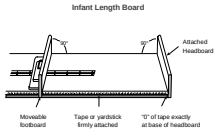
Accurate Weighing and Measuring

- Components
  - Technique
    - Standardized
  - Equipment
    - Calibrated
    - Accurate
  - Trained Measurers
    - Reliable
    - Accurate
- Measures
  - Infant
    - length, weight, OFC
  - Child/adolescent
    - stature, weight
    - skinfolds

Infant Weight

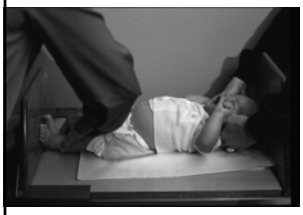
- Infant is weighed nude or in a clean diaper on a calibrated beam or electronic scale
- Center the infant on the scale tray,weigh to nearest 0.01 kg or 1/2 oz.
- Reposition and repeat

Infant Length



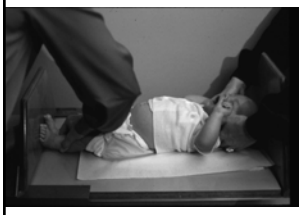
- Length is measured with a suitable measuring board
- Use a calibrated length board with a fixed headpiece and movable footpiece which is perpendicular to the surface of the table

Infant Length



- Measure length for children less than 24 months of age [or children aged 24-36 months who can not stand unassisted]
- Measure infant without shoes and wearing light underclothing or diaper

Infant Length



- One person holds the infant's head so the infant is looking upward and the crown of the head is against the headpiece. This is the Frankfort Plane

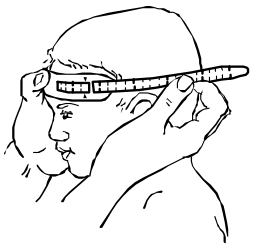
Infant Length

- The measurer aligns the infant's trunk and legs, extends both legs, and brings the footpiece firmly against the feet
- Reposition and repeat

Infant Length

- Would this infant length measurement accurately reflect the infant's growth parameter?

Infant Head Circumference

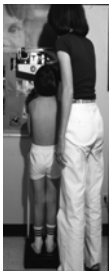


- Head circumference is measured over the most prominent part of the occiput and just above the supraorbital ridges
- Use a flexible, nonstretchable tape

Infant Head Circumference

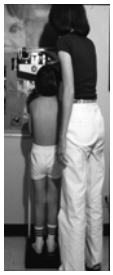
- Position the tape just above the eyebrows, above the ears, and around the biggest part on the back of the head
- Pull tape snuggly to compress the hair
- Read to the nearest 0.1 cm or 1/8 in
- Reposition and repeat

Child and Adolescent Weight



- A child older than 36 months is weighed standing on a scale
- Use a calibrated beam balance or electronic scale
- Child must be able to stand without assistance

Child and Adolescent Weight

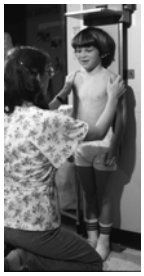


- Wears lightweight undergarments, gown, or lightweight clothing
- Stands on center of scale platform
- Read to the nearest 0.01 kg or 1/8 lb.
- Reposition and repeat

Child and Adolescent Weight

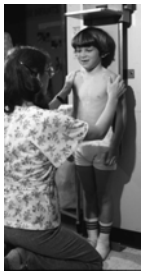
- Does this child meet the criteria for obtaining an accurate weight on scale that requires standing independently?

Child and Adolescent Stature



- Measure stature for children over 36 months of age
- Use a calibrated vertical stadiometer with a right-angle headpiece
- The child is measured standing with heels, buttocks, and shoulders touching a flat upright surface

Child and Adolescent Stature



- Child stands against stadiometer without shoes, with heels together, legs straight, arms at sides, shoulders relaxed
- Child looks straight ahead
- Bring the perpendicular headboard down to touch the crown of the head
- Measurer's eyes are parallel with the

Child and Adolescent Stature

- Does this child meet the criteria for obtaining an accurate stature measurement?

Techniques for ESTIMATION of Stature

- Arm span
- Crown-rump
- Sitting height
- Knee height

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- Useful as 'estimators' of stature when a child or adolescent can not stand independently

Using Arm Span to Estimate Stature

- Arm span may be used to estimate stature if lower extremity contractures or lower body paralysis
- Must be able to fully extend arms and fingers
- 1:1 estimate of stature

Using Arm Span to Estimate Stature

- Is measurement of arm span as an estimator of stature a reasonable technique for this child?

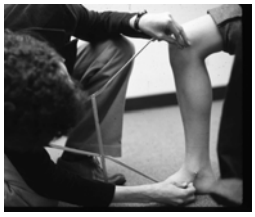
Using Crown-rump Length to Estimate Stature

- Same technique as length
- Legs at 90^0 angle
- Footboard against buttocks

Using Sitting Height to Estimate Stature

- Same technique as stature
- Must be able to sit independently
- Legs should hang freely [not at a 90^0 angle]
- Subtract height of box from the measurement obtained

Using Knee Height to Estimate Stature



- Anthropometer needed
- Accurate measure is difficult to obtain
- Difficult to interpret

Techniques for Estimating Body Composition

- Triceps skinfold
- Mid-upper arm circumference
- Subscapular skinfold

Triceps Skinfold Measurement

- Locate the acromion and olecranon processes
- Mark the mid-point between the processes

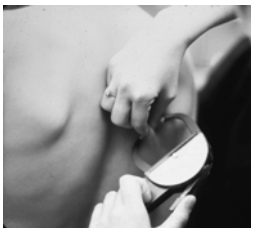
Triceps Skinfold Measurement

- Use an accurate caliper
- Lift the skinfold over the triceps muscle 1 cm above the midpoint mark

Mid-upper Arm Circumference

- Apply the tape over the mid-point mark

Subscapular Skinfold Measurement



- Lift the subscapular skinfold just under the shoulder blade following the natural fold of the skin
- Mark the midpoint of the fold
- Hold the skin 1 cm from the fold, apply the caliper at the midpoint mark

Common errors in measuring infants and young children

- Weight:
  - too many clothes
- Length:
  - not fully extended, Frankfort plane not vertical
- Results:
  - infants and children weighed too heavy or measured too short

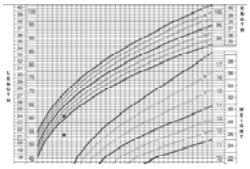
Common errors in measuring infants and young children

- To measure standing children and adolescents as too tall and young children as too short
- To not fully extend young children
- To not use the Frankfort Plane
- To make errors in reading equipment and recording data

Is our clinical judgment influenced by poor anthropometry?

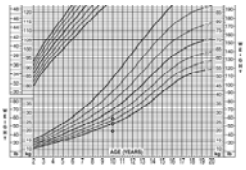
- Outcome of a measurement evaluation session
  - error in infant length
  - error in reading the scale
  - error in calculating age

Measurement Team data



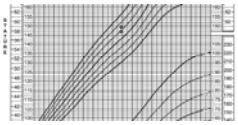
- 5 1/2 mo. old girl
- Range in length measures was 54.4 to 61.0 cm
- These measures plot from <5th %ile to 10%ile.

Measurement Team data



- 10 yr old girl
- Range in weight from 25.8 to 26.8 kg with an 'outlier' of 20.6 kg
- The measures place her at about the 10th%ile for weight, except the 'outlier' which is at <5th%ile.

Measurement Team data



- 11 yr old girl
- Stature measures ranged from 146.5 to 148 cm
- Between 50-75%ile for age
- Plotted as 10 yr old and stature between 90-95th%ile

Why is it important to weigh and measure infants, children, and adolescents accurately?

- Many clinical decisions and clinical interventions are based on physical measurements
- The measurement process has four steps: measure, record, plot, interpret- an inaccurate measurement invalidates all the following steps

Resources

- Growth Chart Training Modules
  - http://depts.washington.edu/growth
    - Developed by MCHB and CDC
- CDC Growth Charts and training information can be found at: http://www.cdc.gov/growthcharts/

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Reference Population: Standard Normal Curve