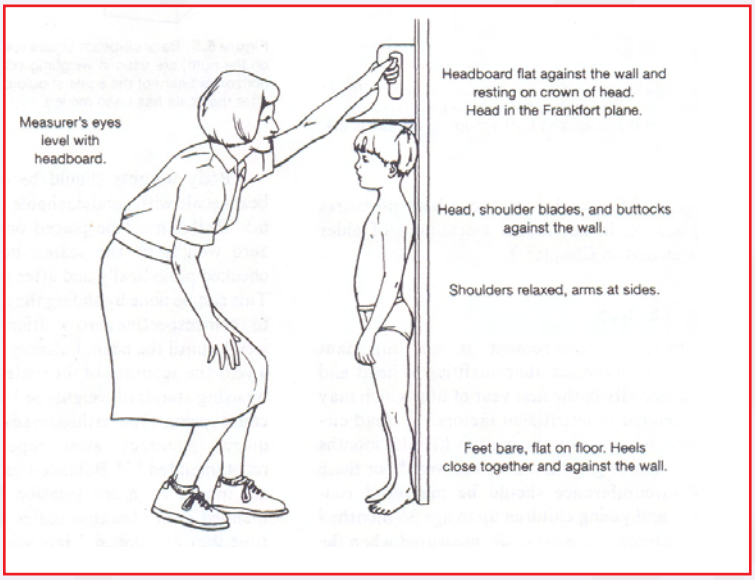
How to Take Anthropometric Measurements

Measuring Height

- The patient must be able to stand without assistance.

- **The simplest equipment to measure height is to fasten a measuring stick or non-stretchable tape measure to a flat, vertical surface (for example, a wall) and use a right-angle headboard for reading the measurement.**
- **If a wall is used, it should not have a baseboard, and subject should not stand on carpet. Using the moveable rod on platform scale is not recommended because it often lacks rigidity, the headboard is not always correctly aligned, and there is no rigid surface against which to position the body.**



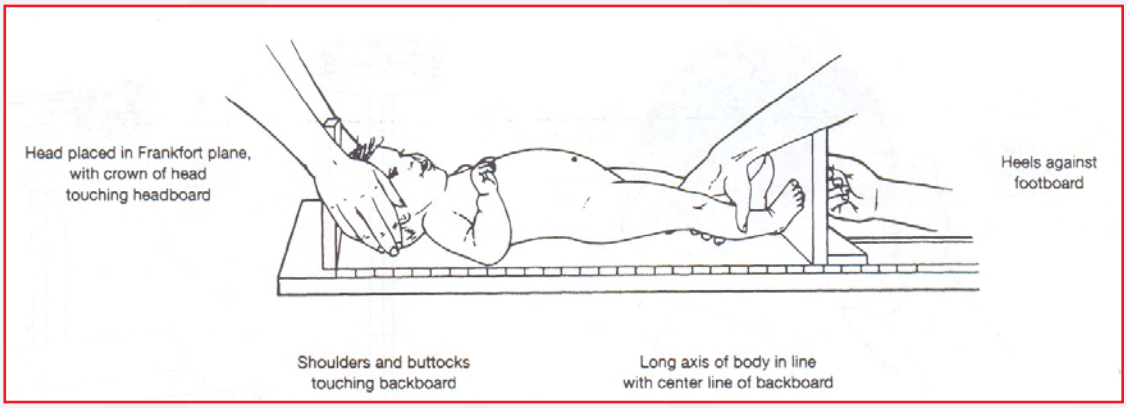
- The patient should be bare footed.
- The subject should stand with heels together, arms to the side, legs straight, shoulders relaxed.
- Position the head in the **Frankfort horizontal plane** ("look straight ahead") **(see below).**
- Heels, buttocks, scapulae (shoulder blades), and back of the head should be against the vertical board of the stadiometer.
- Just before the measurement is taken, the subject should inhale deeply, hold the breath, and maintain an erect posture ("stand up tall"), while the headboard is lowered upon the highest point of the head with enough pressure to compress the hair.
- The measurement should be read to the nearest 0.1 cm. and the eye level with the headboard to avoid errors due to **parallax**.

Measuring Length (recumbent length)

This is mainly for subjects who are below 24 months and those who cannot stand erect without assistance.

Measuring board should have a stationary headboard and moveable footboard that are perpendicular to the backboard.

- The zero ends of the board should be at the edge of the headboard and allow the subject's length to be read from the footboard.
- For this measurement two persons are required to make the measurement.
- The subject should be in the supine position (lying on his or her back).
- One person holds the child's head against the backboard with the crown securely against the headboard and with Frankfort plane perpendicular to the backboard.



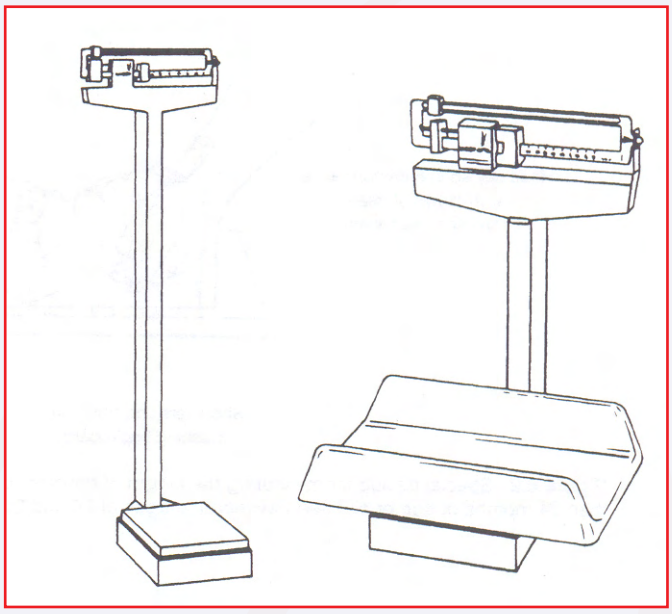
- This person also keeps the long axis of the child's body aligned with the centre line of the backboard, the child's shoulders and buttocks securely touching the backboard, and the shoulders and hips at right angles to the long axis of the body.
- The other person keeps the child's legs straight and against the backboard, slides the footboard against the bottom of the feet (without shoes or socks) with the toes pointing upward, and reads the measurement.
- The footboard should be pressed firmly enough to compress the soft tissues of the soles but without diminishing the vertebral column length. Length should be recorded to the nearest 0.1 cm.

Taking Weights of subjects that can stand without assistance

- Body weights should be obtained using a balance beam scale with non-detachable weights, as shown in Figure below. The zero weight on the scale's horizontal beam should be checked periodically and after the scale has been moved. This can be done by sliding the main and fractional weights to their respective zero positions and adjusting the zeroing weight until the beam balances at zero.
- Two or three times a year the accuracy of the scales should be further assured by using standard weights or by a professional dealer.
- Spring type bathroom scales may not provide the required accuracy after repeated use.
- Scales must be placed on a flat, hard surface.
- The subject should stand still in the middle of the scale's platform without touching anything and with the body weight equally distributed on both feet.
- The weight should be read to the nearest 100 g (0.1 kg) and recorded immediately (two measurements taken in immediate succession should agree to within 100 g (0.1 kg)).
- Diurnal variations (cyclical changes occurring throughout the day) in weight of about 1 kg in children and 2 kg in adults may occur. For this reason, it is a good practice to also record the time weight was measured.
- Ideally, subjects should be weighed with minimal underclothing or an examination gown can be worn, and scales should be placed where adequate privacy is provided.

Taking Weights of Infants

- Infants should be weighed on a paediatric balance-beam scale that is accurate to within 10 g (0.01 kg).



- Any cushion (for example, a towel or diaper) used in the pan either should be in place when the zero adjustments are made on the scale or (but not recommended) its weight should be subtracted from the infant's weight.
- Infants are weighed nude or with minimum clothing.
- The average of two or three weighing is recorded numerically in the infant's file to the nearest 10 g (0.01 kg).
- Excessive infant movement can make it difficult to obtain an accurate weight, in which case the weighing can be deferred until later in the examination.

Measuring Mid Upper Arm Circumference (MUAC)

MUAC measurements are especially for screening for protein energy malnutrition especially when weight and stature cannot be measured among people > 12 months old. When taking the measurements, the following steps should be followed:

1. Except for the infants and the handicapped, the subject should be with the arm hanging loosely and comfortably at the side.
2. MUAC is measured in the midline of the posterior aspect of the arm(over the shoulder top), over the triceps muscle, at a level midway between the lateral projection of the acromion process at shoulder and the olecranon process of the ulna (at the point of the elbow).
3. With the elbow flexed to 90°, the midpoint is determined by measuring the distance between the two landmarks using a tape measure calibrated in centimetres. Mark the lateral side with a visible marker (chalk, pen) then take the measurements. The person taking measurement should make sure the tape is not twisted and is parallel to where the marking was placed.
4. Measurements are recorded to the nearest 0.5 mm.

Definition of Anthropometric Indicators

Anthropometric indicators for children

Indicator	Definition	Implication & use
Birth-weight	The weight at which a baby is born.	It is actually an indicator of maternal nutrition and health status, but has implications for the baby's health.
Weight	Measured as weight in Kg (to the nearest 100g)	Mainly affected by acute infection and/or acute food shortage. If after the infection the child is on an adequate diet weight demonstrates a period of rapid growth (Catch-up growth).
Head Circumference	Measured around the head	Useful in the first 2 years mainly as a measure of brain development.
Mid-upper-arm-circumference (MAUC)	Measured on the left arm. Is not dependent on age.	MUAC is a measure of adequacy in nutrition. A useful measure for screening acute malnutrition in the community. Also used for patients whose weight/height cannot be taken, e.g. are bed ridden.
Weight-for-age	Is a measure of weight compared to the weight of children of the same age and sex from a reference population	It is an indicator of both acute and chronic malnutrition.
Height-for-age	Is a measure of height compared to the height of children of the same age and sex from a reference population	It is an indicator of chronic malnutrition and is used to identify stunted children.
Weight-for-height	Is a measure of weight compared to the weight of children of the same height from a reference population	It is an indicator of acute malnutrition.

Underweight	Weight is below minus 2 standard deviations of expected weight of children of same age from a reference population.	
Stunting	Height is below minus 2 standard deviations of expected height of children of the same age from a reference population	
Wasting	*W*eight is below minus 2 standard deviations of expected weight of children of the same height from a reference population	
Failure to Thrive	The failure of the child to gain weight for more than 2 months (56 days).	This is important in detecting children who are at risk of malnutrition due to disease or inadequate food intake.
Body Mass Index (BMI)	Weight (in Kilograms) divided by height (in metres) squared $=wt\ (kg) \Big/ (ht\ (m) * ht\ (m))$	An indicator of nutritional status
Body Surface Area (BSA)	$\sqrt{\frac{(height\text{-}cm) \times (weight\text{-}kg)}{3600}}$	Used mainly for drug prescription for children.

Anthropometric Indicators For Adults

Indicator	Definition	Explanation/Use
Weight and change in weight	Measured as weight in Kg (to the nearest 100g). A change in weight is measured as % of initial weight. Several measurements have to be recorded for tracking changes in nutritional status.	Mainly affected by acute infection and/or acute food shortage. If after the infection the adult is on an adequate diet, normal weight demonstrates stable health. Excessive weight loss may indicate wasting and presence of chronic illnesses. A 5-10% unintentional decrease in weight is an indication of a health problem.
Weight measurement in pregnant women	Measured as weight in Kg (to the nearest 100g).	In this population weight gain of about 1.5kg per month in the last trimester are consistent with positive pregnancy outcomes in developing countries.
Mid-upper-arm-circumference (MAUC)	Measured on the left arm. Is not dependent on age.	MUAC is a measure of inadequacy in nutrition status. The indicator is useful for assessing acute adult under nutrition to determine prevalence of malnutrition at the population level.
Body Mass Index (BMI)	Weight (in Kilograms) divided by height (in metres) squared $=wt\ (kg) / (ht\ (m) * ht\ (m))$	An indicator of nutritional status for non-pregnant individuals.

BMI References for Adults

CLASSIFICATION	BMI (KG/M²)	RISK OF CO-MORBIDITIES
Severe malnutrition (GRADE III)	<16.0	Very high
Moderate malnutrition (GRADE II)	16.0-16.9	High
Mild malnutrition (GRADE I)	17.0- 18.4	Moderate
Underweight	<18.5	Risk of clinical complications increased
Normal range	18.5 – 24.9	
Overweight	25. 0 – 29.9	Mildly increased risk of co-morbidities
Obese	> 30	Risk of co-morbidities associated with weight

(Source: Http//:www.who.org)

Body Mass Index (BMI) Reference Tables

Height (in meters)	BMI (the cells have the weight for the BMI)							
	20	19	18.5	17.5	16.5	16	15.5	15
1.40	39.2	37.2	36.3	34.3	32.3	31.4	30.4	29.4
1.42	40.3	38.3	37.3	35.3	33.3	32.3	31.3	30.2
1.44	41.5	39.4	38.4	36.3	34.2	33.2	32.1	31.1
1.46	42.6	40.5	39.4	37.3	35.2	34.1	33.0	32.0
1.48	43.8	41.6	40.5	38.3	36.1	35.0	34.0	32.9
1.50	45.0	42.8	41.6	39.4	37.1	36.0	34.9	33.8
1.51	45.6	43.3	42.2	39.9	37.6	36.5	35.3	34.2
1.52	46.2	43.9	42.7	40.4	38.1	37.0	35.8	34.7
1.53	46.8	44.5	43.3	41.0	38.6	37.5	36.3	35.1
1.54	47.4	45.1	43.9	41.5	39.1	37.9	36.8	35.6
1.55	48.1	45.6	44.4	42.0	39.6	38.4	37.2	36.0
1.56	48.7	46.2	45.0	42.6	40.2	38.9	37.7	36.5
1.57	49.3	46.8	45.6	43.1	40.7	39.4	38.2	37.0
1.58	49.9	47.4	46.2	43.7	41.2	39.9	38.7	37.4
1.59	50.6	48.0	46.8	44.2	41.7	40.4	39.2	37.9
1.60	51.2	48.6	47.4	44.8	42.2	41.0	39.7	38.4
1.61	51.8	49.2	48.0	45.4	42.8	41.5	40.2	38.9
1.62	52.5	49.9	48.6	45.9	43.3	42.0	40.7	39.4
1.63	53.1	50.5	49.2	46.5	43.8	42.5	41.2	39.9
1.64	53.8	51.1	49.8	47.1	44.4	43.0	41.7	40.3
1.65	54.5	51.7	50.4	47.6	44.9	43.6	42.2	40.8
1.66	55.1	52.4	51.0	48.2	45.5	44.1	42.7	41.3
1.67	55.8	53.0	51.6	48.8	46.0	44.6	43.2	41.8
1.68	56.4	53.6	52.2	49.4	46.6	45.2	43.7	42.3
1.69	57.1	54.3	52.8	50.0	47.1	45.7	44.3	42.8
1.70	57.8	54.9	53.5	50.6	47.7	46.2	44.8	43.4
1.71	58.5	55.6	54.1	51.2	48.2	46.8	45.3	43.9
1.72	59.2	56.2	54.7	51.8	48.8	47.3	45.9	44.4
1.73	59.9	56.9	55.4	52.4	49.4	47.9	46.4	44.9
1.74	60.6	57.5	56.0	53.0	50.0	48.4	46.9	45.4
1.75	61.3	58.2	56.7	53.6	50.5	49.0	47.5	45.9
1.76	62.0	58.9	57.3	54.2	51.1	49.6	48.0	46.5
1.77	62.7	59.5	58.0	54.8	51.7	50.1	48.6	47.0
1.78	63.4	60.2	58.6	55.4	52.3	50.7	49.1	47.5
1.79	64.1	60.9	59.3	56.1	52.9	51.3	49.7	48.1
1.80	64.8	61.6	59.9	56.7	53.5	51.8	50.2	48.6
1.81	65.5	62.2	60.6	57.3	54.1	52.4	50.8	49.1
1.82	66.2	62.9	61.3	58.0	54.7	53.0	51.3	49.7
1.84	67.7	64.3	62.6	59.2	55.9	54.2	52.5	50.8
1.86	69.2	65.7	64.0	60.5	57.1	55.4	53.6	51.9
1.88	70.7	67.2	65.4	61.9	58.3	56.6	54.8	53.0
1.90	72.2	68.6	66.8	63.2	59.6	57.8	56.0	54.2
1.92	73.7	70.0	68.2	64.5	60.8	59.0	57.1	55.3
1.94	75.3	71.5	69.6	65.9	62.1	60.2	58.3	56.5
1.96	76.8	73.0	71.1	67.2	63.4	61.5	59.5	57.6