PATIENT ASSESSMENT

PART 1 – CALCULATION OF BODY MASS INDEX

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This is part 1 of a six-part series on patient assessment procedures. It discusses the calculation and use of body mass index (BMI). This is a measure of body fat based on height and weight that is commonly used to assess nutritional status, either as a stand-alone tool or as part of a comprehensive nutritional assessment.

The calculation of BMI allows patients to be classified as – underweight, normal weight, overweight or obese for a given height measurement. These classifications are recognised internationally and are published by the World Health Organization as outlined below:

- Underweight <18.5;
- Normal range 18.5–24.99;
- Overweight 25–30;
- Obese >30.

BMI can be calculated using simple mathematics or by using a BMI calculator. To calculate BMI mathematically the patient’s weight (Fig 1) is divided by the result of the patient’s height squared (Fig 2) as below (Fig 3):

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\text{BMI} = \frac{\text{Weight (kg)}}{\text{Height (metres)}^2}\]

If BMI is calculated using this approach it is vital to ensure mathematical error does not occur. BMI calculators are usually of a wheel design (Fig 4) – the patient’s weight is lined up with the height (Fig 5) and the derived value is displayed in a separate window (Fig 6). If these calculators are used nurses should ensure they are from a reputable source and agreed for use by the trust/organisation. BMI calculators are also accessible via the internet; again it is vital to ensure the origin of such calculators is reliable.

METRIC AND IMPERIAL CONVERSION

Most wheel-design calculators depict the height and weight values in both metric and imperial measures. However, if BMI is to be calculated mathematically imperial measures may need to be converted into metric. The mathematical formula is demonstrated below.

To convert feet/inches to metres

First the measurement needs to be converted to inches. Whole feet should be multiplied by 12, and the remaining inches should be added to this. This number should then be converted to centimetres by multiplying by 2.54. This is then divided by 100 to provide height in metres. For example, if a patient is 6ft 2in:

\[
6 \times 12 + 2 = 74\text{in}
\]

\[
74 \times 2.54 = 187.9\text{cm}
\]

\[
187.9 / 100 = 1.88\text{m}
\]
To convert stones to kilograms
First convert stones to pounds (whole stones x 14 plus remaining pounds). To convert pounds to kilograms multiply the total number of pounds by 0.4536. For example: a patient weighs 12st 3lb:

12 x 14 + 3 = 171lb
171 x 0.4536 = 77.5kg

LIMITATIONS OF BMI
The limitations of BMI have been well documented (Dougherty and Lister, 2004; Prentice and Jebb, 2001). The predominant origin of these limitations is the association of weight with increased fat.

There are certain patient groups whose bone structure and muscle mass may give an increased weight, thus an increased BMI, possibly classifying them as overweight or obese. Rugby players and weightlifters are good examples of this. Conversely some athletes may have a very low BMI, possibly classifying them as underweight. BMI may also be a poor indicator of whether the patient is at risk nutritionally, as an apparently normal weight can mask severe muscle wasting (Dougherty and Lister, 2004).

Because of the limitations of BMI as a diagnostic tool other data and information must be considered when assessing nutritional status (Johnstone et al, 2006). This data should include a nutritional history, a measurement of any weight loss over time, biochemical markers and other anthropometrical measurements.

THE PROCEDURE
Equipment required
Ensure you have all the equipment needed to measure a patient’s BMI. The following equipment is required – height measure and weighing scales, a BMI calculator or an electronic calculator (if mathematical calculation is to be performed) and appropriate documentation.

The following steps should take place:
- Obtain informed consent from the patient for the procedure;
- Check any manufacturers’ recommendations for any equipment used;
- Ask the patient to remove shoes, heavy clothing and head wear (bearing in mind cultural considerations);
- Using the height measure, ask the patient to stand, straight, against the measure (head and feet must be as flush against the measure as possible);
- Note (and document) the point of height against measure;
- Place the scales on a firm surface;
- Ensure they are calibrated to zero as indicated in the manufacturers’ guidelines;
- Ask the patient to stand on the scales unsupported (sitting scales should be used for patients unable to stand);
- Note (and document) the point of weight against the scale. Document time of weighing if serial measurements are required;
- Convert height to metres if required;
- Convert weight to kilograms if required;
- Calculate BMI;
- Document results following organisational/trust policy.

REFERENCES
