THE IMPORTANCE OF WEIGHING

The King’s Fund, British Association of Parenteral and Enteral Nutrition and National Institute for Clinical Excellence recommend that all hospital patients should have height and weight recorded, to detect the need for nutritional support.

A literature review suggests that protein and energy supplementation of adults in hospital with a wide range of conditions improves outcome. In addition to the nutritional support and enteral feeding there are other key factors where the patient’s weight is required, for example the management of critically ill patients, respiratory failure, post burns, heart failure, multiple trauma, equipment provision and drug administration to name but a few.

Type of weighing scales
- Stand on, sit on, wheelchair, hospital floor mounted or immersed weigh bridge, hoist and in bed weighing facilities
- The accuracy and frequency of weighing is dependent on local organisational policies and the calibration of the relevant weigh scales / facilities

Indications
- Patients with one or more of the following:
  - BMI <16kg/m
  - Unintentional weight loss >15% in last 3–6 months
  - Little or no nutritional intake for >10 days
  - Low levels of potassium, phosphate or magnesium prior to feeding
  - History of alcohol abuse or drugs: insulin, chemotherapy, antacids or diuretics

Relative considerations
- Is the patient’s weight estimated or accurate? Are you predicting their weight or actually weighing them?
- A baseline weight on admission indicates nutritional status, diuretic therapy, medication. Obtaining accurate weight requires a calibrated weigh scale, an empty bladder, same time of day, clothes and scales
- The method, frequency and accuracy of weighing are dependent on the patient’s clinical presentation
- Depending on the clinical environment, patient diagnosis and associated therapy the type of weight measurement required may be actual, ideal, or adjusted body weight.

### Exhart et al.
- Indicates in oncology patients that lean body mass is the best weight descriptor in underweight and normal weight patients, while adjusted body weight is the best weight descriptor in overweight and obese patients
- The most accurate assessment of your ideal body weight takes into account the composition of your body.
  - How much of your weight is lean body mass (muscle and bone)?
  - Lean Body Weight Men = (1.10 x Weight(kg)) – 128 (Weight²/(100 x Height(m))²)
  - Lean Body Weight Women = (1.07 x Weight(kg)) – 148 (Weight²/(100 x Height(m))²)
  - How much is body fat, ideally 20% of total body weight for men and 30% for women.
  - Ideal Body Weight Men = 50 + 2.3 (Height(in) – 600) (Devine formula)
  - Ideal Body Weight Women = 45.5 + 2.3 (Height(in) – 60) (Robinson formula)
- Adjusted body weight is ideal body weight + (0.4* actual body weight – ideal body weight).
  - This equation accounts for the water content in adipose tissue, to allow accurate drug prescription in those who are >20% above ideal body weight.
- Body Mass Index (BMI) is commonly used to determine whether an individual is under / overweight or obese, again accurate weight and height need to be recorded. Formula for Body Mass Index is Weight (kg) / Height (m)²
Examples of Clinical Reasons for Weighing

- **Bariatric Surgery** – for severe obesity has demonstrated significant health benefits, but it is not without complications and therefore post operatively need to have their weight monitored, to ensure that they are losing weight at an acceptable rate.

- **Burns patient** – initial planning requires an assessment of the body surface damage and identify a direct weight-for-weight fluid replacement programme, the latter will vary in neonates and paediatric due to their physiological differences
  - Administering 1.5 of calculated volume in the first 8 hours post burn,
  - then adjust infusion rate to obtain a 0.5ml/kg/hr = 30–50 ml of urine per hour in patients weighing more than 30kg.
  - 1ml urine per hour / kg in patients weighing less than 30kg with a range of 0.5–2.0ml/kg/hr.
  - When an inhalation injury accompanies thermal trauma, it increases the magnitude of total body injury and requires increased volumes of fluid and sodium to achieve resuscitation from early burn shock. However, due to this increase patients are at risk of developing pulmonary oedema which may result in inadequate cardiac output and lung perfusion, which can impair ventilation perfusion.
  - Monitoring of the patient weight is paramount to ensure accurate fluid management and ventilator parameters.

- **Cardiac** – patients with acute, severe heart failure accumulate excessive fluid, due to blood pressure in the kidneys being reduced, which reduces urine output.
  - Excess fluid accumulates around the heart and lungs.
  - This makes breathing very difficult, and puts excessive pressure on the heart, which reduces cardiac output further.
  - This is a medical emergency, and the patient will die if not treated.
  - Treatment is by administration of a drug that increases urine output (a diuretic).
  - The patient is weighed to monitor fluid management.

- **Myocardial Infarction patients** with unstable heart rhythms and / or severely weakened hearts often need potent drugs to help improve cardiac output and correct the heart rhythm.
  - The dose of these drugs is calculated based on the patient’s weight.

- **“Malnutrition** is a state of nutrition in which a deficiency or excess (or imbalance) of energy, protein and other nutrients cause measurable adverse effects on tissue/body form (body shape, size and composition) function and clinical outcome.”
  - Prevalence of malnutrition in hospital has been quoted as 40% with up to 43% of patients in ICU. The prevalence of malnutrition in hospital can be influenced by the implementation of a variety of nutrition care strategies, in addition to monitoring weight.

- **Nutrition** – patients, who are being fed parenterally or enteraly, as opposed to orally, need to be weighed frequently to ensure that the nutrition they are receiving is adequate. In addition to the patients nutritional requirements consideration must be given to volume administered.

- **Obesity and malnutrition** are not mutually exclusive and obese individuals would be assessed using the same approach as non obese
  - Assessing the extent of unplanned weight gain or loss to indicate any loss of lean body mass which can lead to subsequent malnutrition
  - It is common to see obese patients in the acute setting as obesity predisposes to many co-morbidities such as Type 2 diabetes, coronary heart disease, surgical diseases: cancer, gallstones, GORD etc
  - Obesity and critical illness are associated with a variety of metabolic changes that affect nutritional status and requirements with alterations in fat metabolism, glucose utilisation and insulin response
  - Without proper assessment catabolic injury can occur because prejudice may mean nutritional support being withheld
  - This offers increased risk of post op stress, bacteraemia, sepsis than ‘lean’
  - With obese patients nutritional assessment is key so a clinician must decide on ideal body weight (IBW), actual body weight (ABW) or adjusted weight
  - From this a decision will be made on whether to feed below energy requirements (hypocaloric) and protein level required

Obese patients often have special health needs, such as lower extremity oedema or respiratory insufficiency that require targeted evaluation such as monitoring weight and treatment.

- **Pharmacokinetics** – Recommended or therapeutic drug doses enable one to calculate the correct dose of drug for the patient. Usually expressed in mg/kg or mcg/kg. Obesity as an example alters the disposition of drugs in the body which should be considered when prescribing.
  - Failure to adjust doses based on patient weight may result in therapeutic failure or toxicity.
  - Volume of distribution depends on the lipophilicity of the drug, i.e. fat soluble drugs are excreted in the bile and through the faeces
  - Increased organ mass, lean body mass and blood volume can affect hydrophilic medications, i.e. water soluble drugs are excreted in the urine

- **Renal** – it is often assumed that patients undergoing renal dialysis will need to be weighed very accurately throughout the procedure, to ensure that the level of fluid in their body remains consistent.
  - The accurate fluid pressure management facility for volume monitoring on the dialysis machine is used, as this is more reliable and accurate than external weighing.
Respiratory – patients with acute lung injury (ALI) or adult respiratory distress syndrome (ARDS)

- A “lung protective” strategy of employing ventilation with low tidal volumes (6mls/kg) based on ideal body weight significantly reduces mortality (22% decrease) among patients with acute lung injury (ALI) and acute respiratory distress (ARDS) xxvi xxvii
- Actual body weight is influenced by obesity, pre hospital morbidity and fluid resuscitation. Changes in actual body weight due to fluid accumulation and increased adipose tissue does not change lung size, with actual body weight being potentially up 30% greater than ideal body weight xxviii
- A survey of 92 UK ICUs in 2005 identified that only 13% used actual body weight to calculate tidal volume whilst 53% still use an estimated / predicted weight rather weighing the patient and securing an ideal body weight xxix

Summary

In conclusion, a malnourished patient could have a 50% increase in their hospital length of stay; with 75% of ‘in patients’ loosing weight during their hospitalisation.

The above examples of clinical reasons for weighing are not exhaustive, however it is obvious that inaccurate information regarding a patient’s weight will not only affect the patient’s physiological outcome, but also endanger the healthcare provider as they use equipment that may not be fit for purpose as the patient’s weight and dimension exceeds the products safe working load.

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### THE IMPORTANCE OF WEIGHING

**What impact does it have?**

**FACT:** Research demonstrates a 20% variation (estimated versus actual body weight)

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<td>mgs/kg/minute (BNF)</td>
<td>Incorrect therapeutic dosage</td>
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<tr>
<td>Ventilation</td>
<td>↓ mortality seen with a tidal volume of 6mls/kg</td>
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<td>Nutrition</td>
<td>35kcal/kg and 1.8g/kg of protein (NICE)</td>
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<td>Output &gt;0.5mls/kg/hr</td>
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<td>Use body weight to determine fluid balance</td>
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<td>Equipment</td>
<td>Safe working load?</td>
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