Size Descriptors & Drug Dosing

For the majority of patients the actual (total) body weight (ABW or TBW) is the weight to be considered for dosing drugs etc. It is generally only when patients come within the definition of "obese" (BMI >30) that significant effects on drug handling may be seen, due to the different proportions of adipose tissue, which has minimal contribution to the body's metabolic processes (including drug clearance). Below is a brief overview of the various size descriptors that are commonly used.

Actual (Total) Body Weight (ABW/ TBW) – Because overweight patients tend to have a higher proportion of adipose tissue than "normal" patients, their distribution and metabolism of drugs may also be different. Use of ABW for chronic dosing therefore risks overdosing with hydrophilic drugs and underdosing with lipophilic drugs.

Body Mass Index (BMI) – $TBW(kg)/Ht(m)^2$
Also cannot differentiate adipose tissue from muscle mass, though indicates those that are likely to be overweight. Takes no account of gender differences.

Body Surface Are (BSA) – $TBW^{0.425}(kg) \times Ht^{0.725}(m) \times 0.007184$
Does consider height and weight as separate factors, but again does not consider gender. Commonly used in chemotherapy regimens in oncology.

Ideal Body Weight (IBW) – 45.5 + [0.89x(Ht(cm)-152)] + (4.5 if male)
Based on actuarial mortality tables which suggested optimal weights for heights to maximise survival, so no direct relevance to drug handling. Essentially flawed as it assumes that individuals of the same sex and height have exactly the same ideal mass.

Maximum Body Weight (MBW) – New term based on IBW + 20%. Sometimes used in the Cockcroft & Gault equation for calculating GFR. Same issues as for IBW.

Adjusted Body Weight (AdjBW) – IBW + (correction factor x [TBW –IBW])
A variation on the IBW which applies a correction factor (which varies between drugs) to account for the presumed altered distribution of the drug within the excess adipose tissue.

Lean Body Weight (LBW) – (9270 x TBW) / (6680 + 216 x BMI) for males
(9270 x TBW) / (8780 + 244 x BMI) for females
Takes into account the gender, height and weight (so body build) to estimate the fractional fat mass, so in theory is a good model for drugs that are highly hydrophilic.

In general, drug clearance does not increase in proportion with total body weight in obese individuals. Calculation of the creatinine clearance in obese patients using the Cockcroft & Gault equation should use IBW (or probably LBW), not ABW, since muscle mass is proportionately much less in obese patients. Volume of distribution is consistently increased in patients with excess adipose tissue, and this increase seems to be related to the physico-chemical properties of the drug. This implies that drugs that are dosed acutely eg anaesthetic agents, will require different dosing considerations from those that are dosed chronically.

Note that most of the work relating to these equations was carried out on previous generations, when there were fewer subjects in the upper extremeties of the weight range than in the present day, and there is very little validation for the use of any of these descriptors for drug dosing.

In summary, there is no single size descriptor that is better than others for drug dosing in obese patients. Generally, for acute dosing the TBW should be used. For chronic dosing, refer to expertise in the area of drug handling (eg pharmacist).Weights used in assessing eg nutritional or haemofiltration requirements or ventilatory parameters may not be applicable for drug dosing, and vice versa.

Refs: Green B, Duffull S Br J Clin Pharmacol 58:2 119-133
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