The Modified Lemmens method

for estimation of lean mass

and

energy and protein requirements in obese patients

Based on a method described by Lemmens et al in *Obesity Surgery* 2005 and Kreymann et al *Clin Nutr ESPEN 2015*

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1. **Calculate Standard Lean Body weight (SLBW) as follows**:

23 x height in m^2 (men)

22 x height in m^2 (women)

Or refer to the table to the right where SLBW has been pre-calculated for various heights using this formula.

2. **Use the SLBW to calculate energy** requirements in kCal/kg, where the recommendation is to provide 25kCal/kg SLBW to achieve hypocaloric feeding.

Table 1. SLBW for height

Height (cm)	SLBW (men)	SLBW (women)
140	45	43
145	48	46
150	52	50
155	55	53
160	59	56
165	63	60
170	66	64
175	70	67
180	75	71
185	79	75
190	83	79
195	87	84
200	92	88

Estimation of Lean Body Mass

3. Use the table below to obtain the corresponding average Lean Body Mass (LBM) for the Standard Lean Body Weight and height.

Table 2. LBM for height and SLBW

Height (cm)	SLBW (men)	Ave LBM (men)	SLBW (women)	Ave LBM (women)
140	45	37	43	30
145	48	39	46	32
150	52	42	50	35
155	55	45	53	37
160	59	48	56	39
165	63	51	60	42
170	66	54	64	45
175	70	57	67	47
180	75	61	71	50
185	79	64	75	53
190	83	68	79	56
195	87	71	84	59
200	92	75	88	62

4. Decide how much protein in g/kg you would give to a normal weight/lean patient with the same clinical condition.
5. Using the LBM obtained from Table 2 in Step 3 above, calculate the protein requirement in g/kg LBM.
6. Since obese patients have relatively higher LBM than normal weight patients, total protein requirement is determined by multiplying the protein calculated in Step 5 by a LBM ratio dependent on BMI, according to Table 3 below.

Table 3. LBM ratio to account for proportional higher LBM at higher BMI

BMI	LBM ratio (men)	LMB ratio (women)
30	1.1	1.1
35	1.2	1.2
40	1.3	1.3
45	1.4	1.3
50	1.5	1.4

See example calculations below.

Example calculations

Example 1

In a female patient with an obese BMI of 32kg/m^2, and a height of 166cm.

1. Obtain SLBW (Table 1) = 60kg
2. Calculate energy @ 25kcal/kg SLBW = 25 x 60 = 1500kCal
3. Obtain LBM (Table 2) = 42kg
4. For a lean person of same clinical condition, protein requirement is ≈ 1.5g/kg
5. Protein requirement = 42 x 1.5 = 63g
6. Use LBM ratio (Table 3) for nearest BMI = 1.1 x 63 = 69g final total protein

Example 2

In a male patient with an obese BMI of 39kg/m^2, and a height of 180cm.

1. Obtain SLBW (Table 1) = 75kg
2. Calculate energy @ 25kcal/kg SLBW = 25 x 75 = 1875kCal
3. Obtain LBM (Table 2) = 61kg
4. For a lean person of same clinical condition, protein requirement is ≈ 1.3 – 1.6g/kg
5. Protein requirement = 61 x 1.3 = 79g to 61 x 1.6 = 98g. Range 79-98g.
6. Use LBM ratio (Table 3) for nearest BMI = 1.3 x 79 to 1.3 x 98 = 103 -127g final total protein required