Simplified Estimation of Lean Body Weight Using Body Mass Index in Pediatric Patients

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Background

There has been a major increase of clinical obesity in the pediatric population over the recent years, with altered pharmacokinetics and pharmacodynamics requiring changes in drug dosing with lean body weight (LBW) instead of total body weight.

- A formula such as the one proposed by Peters et al [1] (i.e. LBW = 3.8 x (0.0215 x weight (kg)**0.6469 x height (cm)** 0.7236).
- difficult to recall.
- Hypothesis: A simplified and practical method for determination of LBW could be directly calculated with the patient's own BMI value.

Methods

- Using published clinical data of obese children [total body weight (TBW) and height] as testing data [2]
- A series of linear regression analyses and Bland-Altman plots were computed comparing the estimated LBW, derived from one commonly used LBW equation [1] with the proposed simplified equations
- (100 - BMI) x TBW for males (M), and (90 - BMI) x TBW for females (F)].
- Defined the acceptable difference limit between equations to be less than 10%.

Results

- *Figure 1*. showed that the coefficient slopes were approximately 1 (i.e. y=x) for both boys and girls,
- The simplified formula is highly correlated to the predicted LBW calculated from the complex Peter formulas.
- Bland-Altman plots showed only a few outlying points outside the 10% limit when comparing the formulas.

Discussion

- Demonstrates that the proposed simplified equations using BMI provide estimations of LBW comparable to commonly used formulas.
- This may facilitate the calculation of LBW at the bedside and in emergency situations.
- These results support BMI, a value calculated from the patient's height and weight, which can be used as an indicator of obesity as well as to calculate LBW
- Further studies are needed to test the formula using a larger pediatric population data

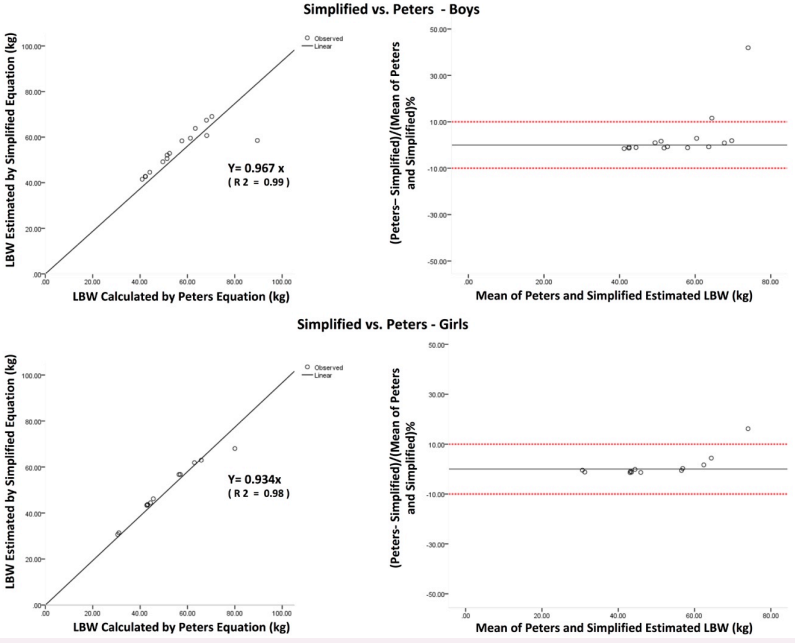

Figure 1. Relationship between Peter's formula and the simplified equation.

Conclusion

- The simplified equation utilizing BMI can provide a more practical way to estimate LBW by replacing complex equations with one equation (gender specific) that is easier to remember and provides equivalent results.

References

1. Peters AM et al. Estimation of lean body mass in children. Br J Anaesth 2011; 106(5):719-23.
2. Forbes GB. Lean body mass and fat in obese children. Pediatrics 1964;34:308-14.
3. Jackson AS et al. The effect of sex, age and race on estimating percentage body fat from body mass index: The Heritage Family Study. *Int J Obes* 2002; **26**: 789–96.