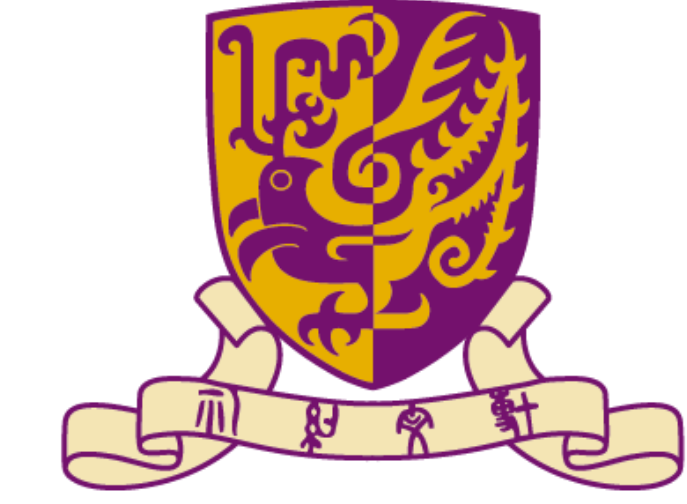


Practical Bedside Estimation of Lean Body Weights using Body Mass Index for Regional Anesthesia

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INTRODUCTION

Increasing clinical obesity has changed local anesthetic dose determination.

- Pharmacokinetic differences justify lean body weight (LBW)-based maximum local anesthetic dosing modifications.
- Retrospective research showed significant differences in LBW- and TBW-based ropivacaine doses.
- The study hypothesizes that male lean body weight is directly related to $(100 - \text{BMI}) \% \times \text{TBW}$.
- We also hypothesize that female lean body weight is directly related to $(90 - \text{BMI}) \% \times \text{TBW}$ because females have a 10% higher percentage fat than males

METHODS

- Study on Lean Body Weight Estimation
- Testing consistency uses Bland-Altman plots.
- Compares estimated LBWs from **Boer's** equation vs simplified equations (BMI-M and BMI-F).
- (Male: $\text{LBM} = 0.407 \times \text{weight}(\text{kg}) + 0.267 \times \text{height}(\text{cm}) - 19.2$)
- Female: $\text{LBM} = 0.252 \times \text{weight}(\text{kg}) + 0.473 \times \text{height}(\text{cm}) - 48.3$)

RESULTS

- A demographic retrospective study of 500 single-shot peripheral nerve block patients
- Figure 1 & 2 shows that the simplified equations (BMI-M and BMI-F) estimate LBM similarly to the Boer equation.
- Bland-Altman plots show that most LBM simplified using BMI-M and BMI-F values are within 10% of the Boer equation LBM.

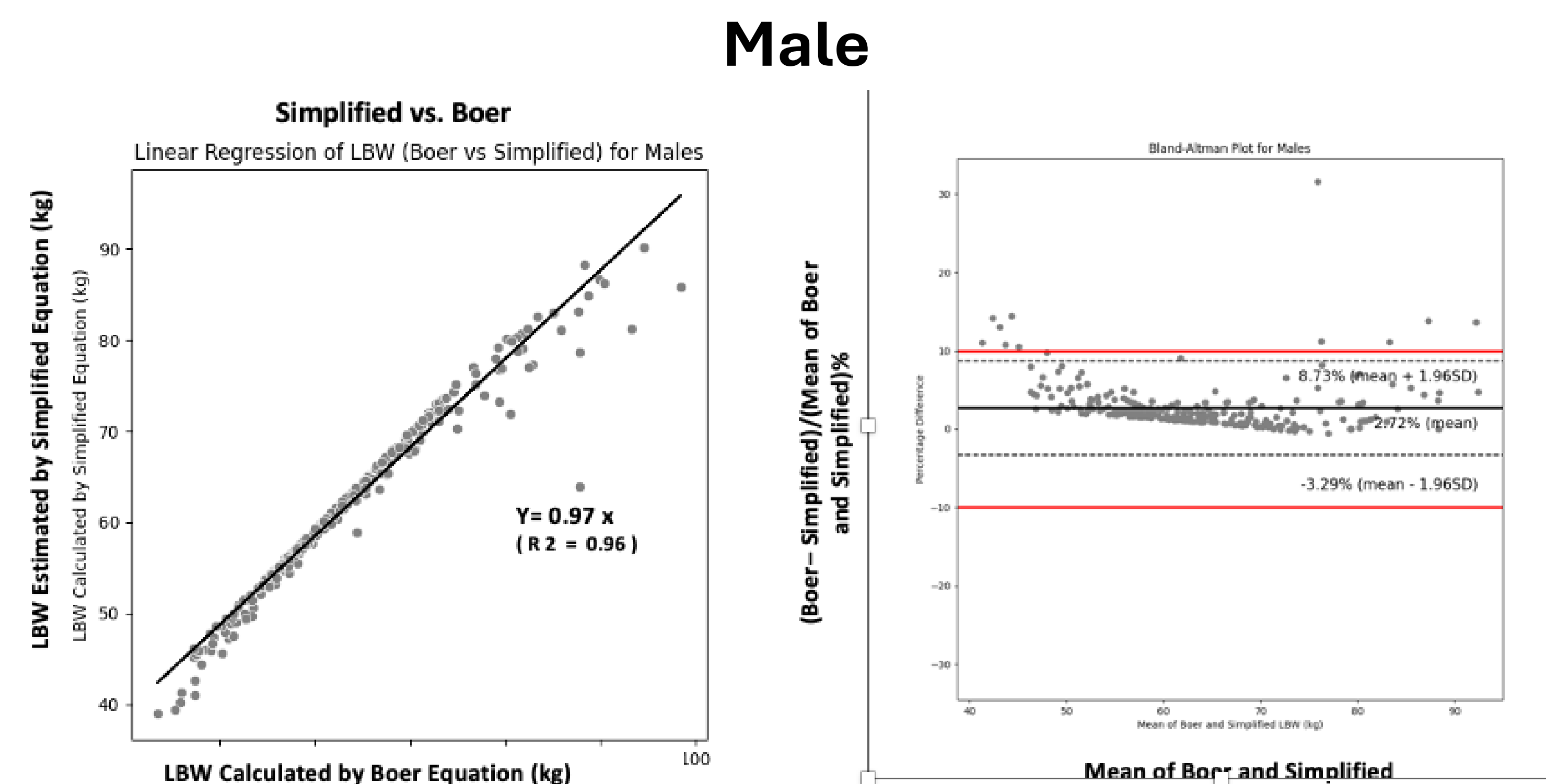


Figure 2. Relationship between Male LBW estimated by simplified equation $(100 - \text{BMI}) \% \times \text{TBW}$ and that calculated by the Boer formula. The graphs show lines marking the 10% margin of difference that we have determined to be clinically significant, and in addition, we have also calculated and plotted the limits of agreement (mean difference $\pm 1.96 \times$ Standard deviation (SD) of mean difference). (Left) There was a positive correlation between LBW estimated by simplified equation and that calculated by the Boer formula. (Right) Bland-Altman plot revealing close agreement between LBW estimated by the simplified equation and Boer formula as most of the data were within the limits of agreement line

RESULTS

Female

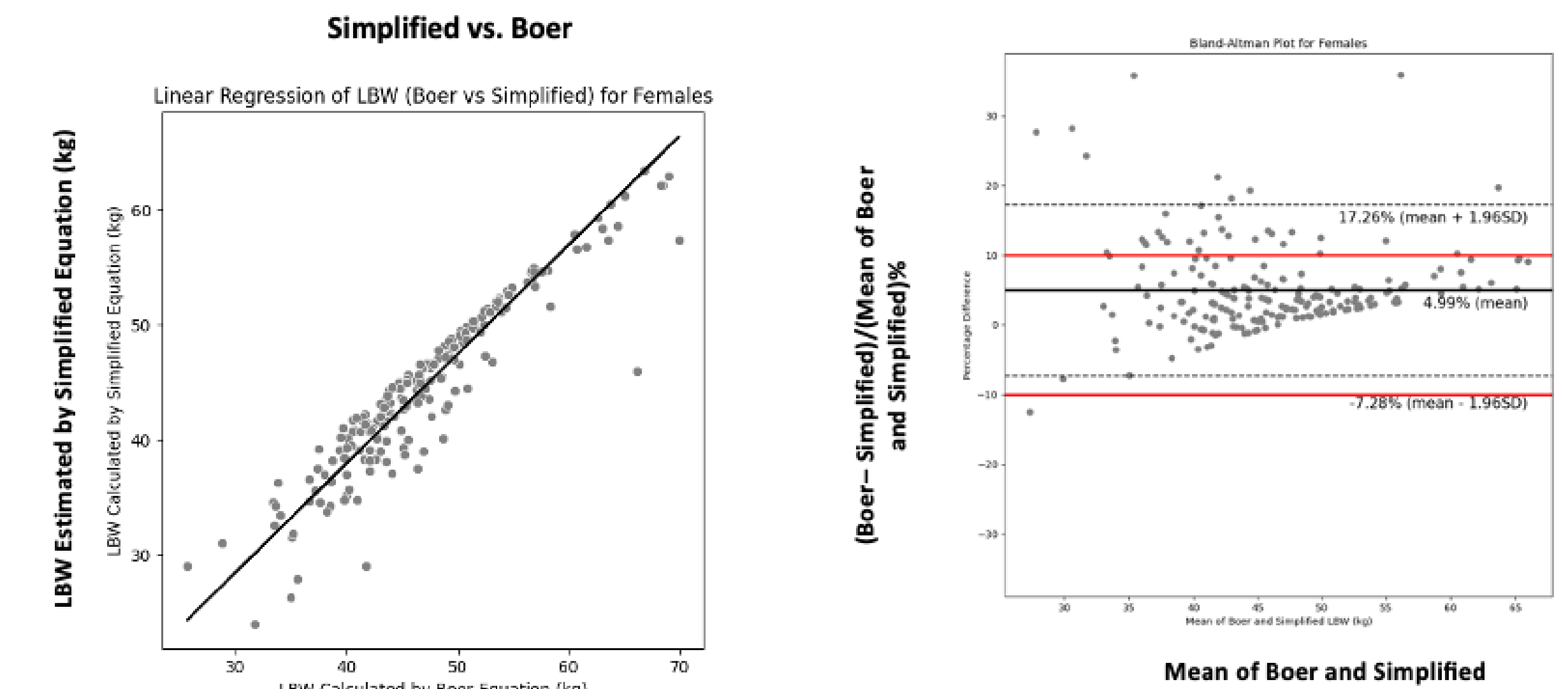


Figure 2. Relationship between Female LBW estimated by simplified equation $(90 - \text{BMI}) \% \times \text{TBW}$ and that calculated by the Boer formula. The graphs show lines marking the 10% margin of difference that we have determined to be clinically significant, and in addition, we have also calculated and plotted the limits of agreement (mean difference $\pm 1.96 \times$ Standard deviation (SD) of mean difference). (Left) There was a positive correlation between LBW estimated by simplified equation and that calculated by the Boer formula. (Right) Bland-Altman plot revealing close agreement between LBW estimated by the simplified equation and Boer formula as most of the data were within the limits of agreement line

DISCUSSION & CONCLUSION

A simplified BMI equation can offer a more practical method of estimating LBW using a single, easier-to-remember, gender-specific equation that yields the same results.

REFERENCES

1. Kamonchanok Tengwongderm and Ban Tsui. A single-shot local anesthetic overdose is more common in women than men, regardless of BMI. ASA 2024 Annual Meeting Abstract #7875
2. Rothman KJ. BMI-related errors in the measurement of obesity. Int J Obes [Internet]. 2008 Aug [cited 2017 May 16];32:S56–9. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/18695655>
3. Kupusinac A, Stokić E, Sukić E, Rankov O, Katić A. What kind of Relationship is Between Body Mass Index and Body Fat Percentage? J Med Syst [Internet]. 2017 Jan 8 [cited 2017 May 16];41(1):5. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/27826765>
4. Jackson AS, Stanforth PR, Gagnon J, Rankinen T, Leon AS, Rao DC, 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 [Internet]. 2002 May 30 [cited 2017 May 16];26(7):953–60. Available from: <http://www.nature.com/doi/10.1038/sj.ijo.0802037>
5. Boer P. Estimated lean body mass as an index for normalization of body fluid volumes in humans. Am J Physiol. 1984 Oct;247(4 Pt 2):F632–6. doi: 10.1152/ajprenal.1984.247.4.F632. PMID: 6496691.