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Background

Fluid volume assessment remains a challenge in clinical nephrology. Bioimpedance has gained widespread popularity and has the potential to guide fluid management in various aspects. Bioimpedance allows the assessment of total body water (TBW) thus providing insight into fluid status. We aimed to investigate the accuracy and precision of TBW measurements with a segmental multifrequency bioimpedance device (InBody 770; InBody USA, Cerritos, CA, USA) by comparing the peridialytic changes in weight and TBW in hemodialysis (HD) patients.

Methods

Patients underwent pre- and post-dialysis bioimpedance assessments on multiple occasions. Bioimpedance measurements were conducted with patients standing barefooted on the platform of the InBody 770 device. That platform serves as a scale and has also sensing / injecting electrodes integrated. Additional sensing / injecting electrodes are located in hand grips that are held by the patient.

For this analysis we used the peridialytic weight change (ΔWt) as the reference. We investigated the accuracy and precision of the InBody 770 to detect peridialytic changes in TBW (ΔTBW ; expressed as kg) as compared to ΔWt . We report the mean of the differences of ΔWt to ΔTBW and employed Bland-Altman analysis to assess accuracy, precision, and proportional error. A regression model with fixed effects accounted for within-patient correlation using generalized estimating equations.

Results

We analyzed 303 treatments from 22 patients (median 13 measurements per patients [IQR 7 to 18]). Patient characteristics were as follows: age 61.4 ± 14 years, 59% male; body mass index 25.7 ± 4.6 kg/m², and interdialytic weight gain 2.5 ± 0.48 kg. The average of ΔTBW minus ΔWt was 0.19kg with a standard deviation of 0.82 kg. A significant trend in bias for the difference between ΔTBW and ΔWt was found (slope estimate -0.15; $P=0.047$) (Figure 1). Figure 2 shows the relationship between ΔWt and ΔTBW .

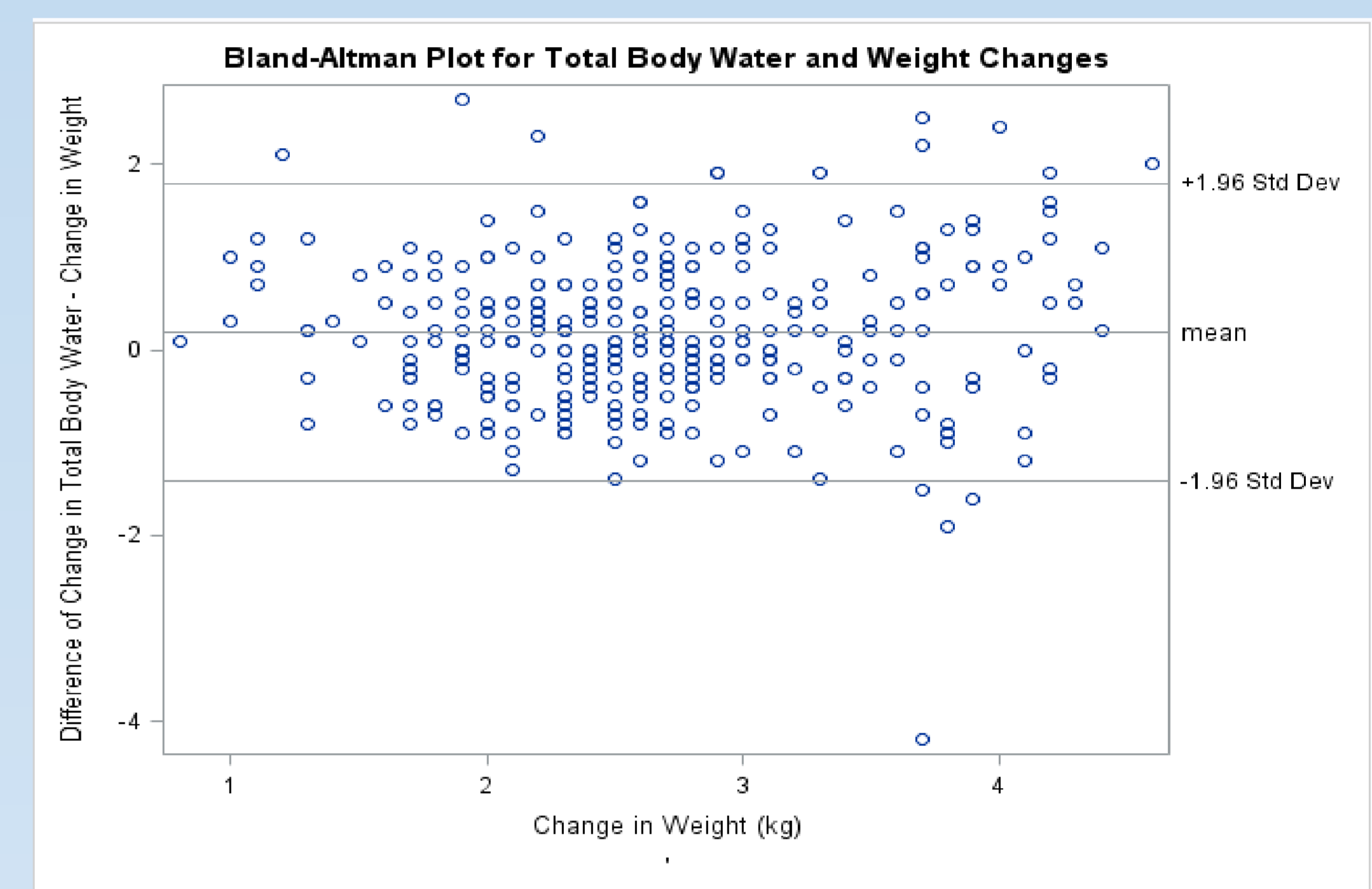


Figure 1



Figure 2

Table 1: Patient characteristics

Parameters	N=22
Age, years	61.5 ± 14
Male	13 (59%)
Vintage, years	6 ± 5.3
BMI	25.7 ± 4.6
Race	
Black	9 (41%)
White	9 (41%)
Asian	2 (9%)
Unknown/other	2 (9%)
Hispanic	7 (32%)
Number of measurements (median, IQR)	13 (7 to 18)
IDWG (kg)	2.5 ± 0.5

Conclusions

Our analysis of peridialytic change of TBW as measured by the InBody 770 device compared to peridialytic weight change shows clinically acceptable accuracy, while precision is less satisfactory. The Inbody 770 device tended to overestimate the change in TBW as the peridialytic weight reduction increased. Studies in a larger population with greater diversity of body composition, a known confounder of accuracy and precision of bioimpedance, are needed to draw final conclusions.