Spine Phantoms are Inadequate for DXA Whole Body Composition Cross-Calibration
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Objective: Patient assessment continuity requires measurements be consistent between densitometers; consequently, cross-calibration is necessary. To this end, when replacing a DXA unit with the same model, ISCD recommends scanning phantoms 10 times on each instrument and states spine BMD should be within 1%, while %fat, lean and fat mass should be within 2% of the prior instrument. We report a total body cross-calibration experience with phantoms and humans.

Materials and Methods: Cross-calibration between an existing and new Lunar iDXA was performed using 3 encapsulated spine phantoms (GE-Lunar, BioClinica & Hologic), one body composition phantom (BioClinica) and 30 human volunteers. Thirty scans of each phantom and a total body scan of human volunteers were obtained on each instrument.

Results: All spine phantom BMD means were similar (within 1%) between existing and new unit, -0.010 g/cm² bias. The total body phantom (TBP) BMD and BMC values were within 2% with biases of 0.005 g/cm² and 3.3 g. However, lean, fat and %fat mass measurements differed by 4.6 to 7.8% with biases of +463 g, -496 g and -2.8%. In-vivo comparison verified TBP data; BMD/BMC were within ~2% but lean, fat and %fat differed from 1.6 to 4.9% with biases of +833 g, -860 g and -1.2%. As all body composition values exceeded the recommended 2%, the new instrument was recalibrated to conform with existing scanner. Post recalibration analysis of in-vivo scans revealed reduced bias for lean and fat; -22.7 g and -4.6 g, reducing difference to 0.1%. Similarly, agreement of TPB lean and fat improved.

Conclusion: Recognizing we studied only iDXAs, these data suggest the BioClinica TBP behaves similar to human in-vivo measurements for densitometer cross-calibration. Additionally, although falling within the recommended 1% BMD and BMC, spine phantoms did not detect substantial differences in lean and fat mass observed with the TBP and in-vivo assessments. Consequently, spine phantoms alone are not adequate to assure whole body composition DXA cross-calibration.