

Self-Reported Weight and Height in Nuclear Medicine Patients: A Common Mistake Confusing Reliability and Accuracy

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I read the recent article by Blum KS et al. with great interest published in the *J Nucl Med Technol* 2019. The authors aimed to assess the reliability of the self-reported weight and height of nuclear medicine patients in view of recommendations for weight-dependent tracer application for imaging and therapy (1). In total, 824 patients (334 men and 490 women) were asked to report their weight and height before imaging or therapy and their level of confidence. Subsequently, the weight and height of each patient were measured, and body mass index, body surface area, and lean body mass were calculated. Differences between reported and true values were compared for statistically significant differences. They reported that an over- or underestimation of weight by at least 10% was observed in 2% of patients, and height was overestimated by 1% by the patients. Surprisingly, they concluded that most self-reported weights and heights of nuclear medicine patients are accurate.

However, there are some methodological issues regarding accuracy and reliability that is provided below: First, it is crucial to know that accuracy and reliability are two completely different methodological issues. Accuracy means the degree to which the result of a measurement, calculation, or specification conforms to the correct value or a standard. In another words, accuracy is the most important criteria for the quality of a test and refers to whether or not the test measures what it claims to measure. The core design for determining and measuring the accuracy of a test is a comparison between an index test and a reference standard by applying both on similar people who are suspected of having the target result of interest. However, reliability indicates to refinement in a measurement, calculation, or specification, especially as represented by the number of digits given. Accuracy studies should report significant and comprehensive information together with the absolute number of true-positive, false-positive and false-negative as well as true-negative information or give info to alter their calculation in order that a minimum of one diagnostic performance indicator [i.e. sensitivity, specificity, predictive values or likelihood ratio (LR)] could be calculated. Then we recommend applying the most appropriate estimates to evaluate accuracy of the self-reported weight and height. To assess accuracy, Pearson r or Spearman rho can be applied when we are facing with a quantitative variable. However, for qualitative (binary) variables, sensitivity (Sen), specificity (Spe), positive predictive value (PPV), negative predictive value (NPV), likelihood ratio positive (ranging from 1 to infinity; the higher the LR+, the more accurate the test), likelihood ratio negative (ranging from 0 to 1; the lower the LR-, the more accurate the test), as well as diagnostic accuracy and odds ratio (ratio of true to false results) are among well-known estimates to assess accuracy (2-8).

Second, what is critically important is reliability which is conceptually different with accuracy and consequently our methodological and statistical approach to assess reliability should be different. Depending on the type of the variable, appropriate estimates to assess reliability are completely different. For quantitative variable, we can apply either Intra-Class Correlation Coefficient or Bland-Altman Plot. For qualitative variable, to assess intra or inter-observer reliability, we can apply weighted or Fleiss kappa respectively.

So, due to inappropriate use of statistical tests (Student t.test and ANOVA) for accuracy and reliability analysis as well as misinterpretation of the results, there may be a high level of uncertainty for their conclusion and there are not sufficient pieces of evidence to conclude that self-reported weights and heights of nuclear medicine patients are accurate.

Keywords: reliability; accuracy; nuclear medicine imaging and therapy; self-reported weight and height

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