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AMERICAN ACADEMY OF OPHTHALMOLOGY®

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Re: Hoffer et al.: Update on intraocular lens power calculation study protocols: the better way to design and report clinical trials (*Ophthalmology*. 2020; Jul 9 [Epub ahead of print].

TO THE EDITOR: We appreciate the efforts by Hoffer and Savini in attempting to provide an organized system to quantify the accuracy of intraocular lens (IOL) power calculation formulas, methods, and instruments.[1] We agree with several of their recommendations, but disagree with several others that we have elucidated fully in an article that will appear in the *Journal of Cataract and Refractive Surgery* in January 2021.[2] In this letter, we highlight some of the primary differences, especially regarding the use contemporary heteroscedastic statistical methods.[3,4]

The fundamental difference in our methods of statistical analysis versus those of Hoffer and Savini is that they compare the means and medians of absolute values using the Student *t* test or the Wilcoxon test, which are known to be unsatisfactory.[3,4] The goal is to compare the marginal variances (standard deviations), because 2 formulas can have the exact same mean and median absolute values with vastly different spreads (standard deviations), making the 2 formulas significantly different in their clinical performance (points 4 and 5 below).

In our article,[2] we discuss the key elements for describing and analyzing the accuracy of IOL calculation formulas. Based on the analysis of multiple datasets and IOL power calculation formulas, we (1) outline the criteria for patient and data inclusion; (2) recommend the appropriate sample size; (3) reinforce the requirement that the formulas be optimized to bring the mean error to zero; (4) demonstrate why the standard deviation is the single best parameter to characterize the performance of an IOL power calculation formula; it determines the percentage of cases within a given interval, the mean absolute deviation, and the median of the absolute values, making their comparisons redundant and eliminating the need for a formula performance index; and (5) propose that the heteroscedastic statistical method is the preferred method of analysis, especially for smaller datasets,[3,4] as opposed to the statistical methods suggested by the authors. The heteroscedastic method addresses the probability of a type I error when the marginal distributions are not normal and have heavy tails but are still symmetric. Details for downloading the open access software from The R Project for Statistical Computing can be found at https://www.r-project.org/ and details regarding how to implement heteroscedastic analysis are in the README files at https://osf.io/nvd59/quickfiles.

We hope that the authors will review the preprint of our article,[2] and download and evaluate the open access software to see the significant differences in type I errors made with their older statistical methods compared with the contemporary heteroscedastic methods.

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