Reply: Yes, validity and accuracy take precedence over precision. As 2 of America's preeminent ophthalmic epidemiologists point out, good clinical research contends with bias in a study's design and during data collection and leaves probability calculations for the analysis.[1] Statistics cannot replace sound judgment.—*Kirk R. Wilhelmus, MD, PhD*

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Comparative study of first-day postoperative cataract review methods

Mandal et al.[1] have made an inspirational prospective comparison of the safety, effectiveness, and patient acceptance of different postoperative cataract review methods. They came to the conclusion that telephone review is a reasonable alternative to the other methods. However, we think the authors might have overlooked a major selection bias with regard to the study design and methodology, which may invalidate the study's data.

There are several hidden criteria that patients must fulfill before a telephone review is deemed possible. First, patients have to be able to comprehend the content of the survey correctly through telephone dialogue. This automatically presumes that patients possess several competent physical abilities; namely, reasonable hearing, mental capacity of comprehension, memory, and appropriate speech response. Under these presumptions, elderly with hearing degeneration, senile dementia, or a previous cerebrovascular accident impairing speech articulation are likely to be excluded from the study. Second, patients recruited into the telephone arm must have a minimum command of English to achieve effective communication. People not speaking or not understanding English will also be ineligible for telephone review. Third, patients intended for telephone review must be equipped with a valid telephone number and machine. Accessibility is denied those without a telephone at their home. Most important, summation of these difficulties may imperil the overall safety and efficacy of the telephone review as a channel of communication in the prevention as well as detection of postoperative complications. This inference is supported by an extremely high incidence of postoperative endophthalmitis (2%) in comparison with other major studies of post-cataract-extraction endophthalmitis.[2–4]

Mandal et al. did not provide the baseline characteristics of the 300 patients enrolled; it is not clear whether obvious selection bias was properly controlled in the methodology. In the interest of readers, it would be helpful if further information could be provided.

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Reply: We appreciate the interest of Liu and coauthors in our paper. We did, of course, exclude any patient who was unable to comprehend and cooperate with telephone review, had language difficulties, and or did not have a telephone. These patients would clearly not be suitable for telephone review. Endophthalmitis was present in 2 patients in the telephone review group, presenting at 7 and 10 days, respectively. We do not think these were missed by telephone review but simply presented later. It is not justified to extrapolate an incidence of 2% from such a small sample, and we do not think telephone review in these patients led to a higher incidence of endophthalmitis.

We regularly audit the incidence of endophthalmitis in our unit. Over the past 2 years, since the introduction of telephone review, the incidence has been constant at about 0.15% based on approximately 5500 cataract operations a year. This is in line with published standards[1] and shows no increase from when review was done by first-day examination (2000, 0.19%; 2001, 0.20%).—*David H.W. Steel, MBBS, FRCOphth*

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Autorefraction versus subjective refraction

In the article assessing the utility of autorefraction as an outcome measure of LASIK,[1] Pesudovs found that autorefraction with the Nidek ARC7000A autorefractor showed "excellent agreement" with subjective refraction after LASIK except in cases of high hyperopia, which he attributed to the smaller effective optical zone usually achieved in these patients.

I have an observation and a philosophical objection that relate to Pesudovs' report. The observation: As a patient who had LASIK for myopia that resulted in markedly constricted optical zones,[2] I know that different autorefractors will generate refractions that are repeatable but much more variable (from the subjective refraction and from each other) than Pesudovs found in his study. I agree that this is probably due to a difference in the sampling location; machines that test a larger corneal surface error would be expected to generate a more myopic result. Readers should be aware of this effect and consider it a clinical indicator that a high degree of spherical aberration is originating within the central cornea, not that the previous ophthalmologist's autorefractor was broken.

The philosophical objection: Subjective refraction and autorefraction (or "machine-based, technician-delegated objective refraction") are similar tests only in that they contain the word

"refraction" and generate a result involving 3 numbers. The endpoint of subjective refraction is controlled by the patient, who reports on his or her visual perception; subjective refraction is therefore a psychovisual test that will show a small degree of natural fluctuation over time even when the refractive system is stable. The endpoint of autorefraction is some optical effect that the machine detects and is a function of the corneal, lenticular, and posterior eye-wall curvatures; fluctuation over time is a function of the machine's measurement precision if the refractive system is stable.

In clinical trials of refractive surgical procedures, the measurement of subjective refraction is coincident with measurement of the best corrected high contrast visual acuity; it is the patient's idea of "best" that determines the refraction. Unless Pesudovs proposes that autorefractors will, in addition to calculating a refractive error numerically similar to the subjective refraction, also determine when the patient's high contrast visual acuity is the "best," it is not possible that "autorefraction could substitute for subjective refraction as an outcome measure for refractive surgery." An objective test can never replace a psychovisual test because objective tests eliminate the patient's brain, which is the organ within which the sensation known as "vision" resides. Perhaps some investigators find this preferable.

Pesudovs has shown that Nidek autorefraction provides a reasonable starting point for subjective refraction after LASIK in myopes and low hyperopes. The retinoscope can serve this purpose, and it will also give the ophthalmologist a marvelous insight into the quality of the patient's corneal optics (being, in this regard, much cheaper than a wavefront analyzer).

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Reply: I thank Brown for her interest in this paper.[1] As always, her comments are insightful and extremely valuable given her personal experience. Philosophies aside, science should determine whether subjective refraction and autorefraction produce similar results. This paper was important because it corrects the misconception that autorefraction does not work after laser refractive surgery. This conclusion had been made by 4 separate studies,[2–5] but all had serious methodological problems. Comparisons of refractive errors must be made with vector analysis and Bland-Altman limits of agreement. Through use of the correct methodology, the truth was discovered. Indeed, another article in this journal,[6] which also uses these methods, corroborates this finding.

Having established that autorefraction can be used as an outcome measure for laser refractive surgery, the philosophical question arises as to when it should be used. I agree with Brown that subjective refraction is the preferred methodology. However, there is subjective refraction and there is subjective refraction. Only diligent subjective refraction is satisfactory; a "quick check" is not. In a clinical trial, it may be easy to ensure that adequate time is allocated for careful subjective refraction. Perhaps for audit of routine clinical data, especially in a commercial or high-volume setting with multiple practitioners in which time pressures impact the care with which postoperative refractive error is measured, autorefraction may be a better outcome measure. Certainly, autorefraction is valuable and timesaving as a preexamination test, although I agree it does not provide the same insight into higher-order optics that retinoscopy provides.

Coincidently, it is wavefront sensing that will supplant the role of conventional autorefraction in time. Brown states that autorefractors cannot substitute for subjective refraction as an outcome measure of refractive surgery unless autorefractors "determine when the patient's high contrast visual acuity is the best." This is exactly the principle of the Wavefront Analysis Technologies refraction system. This takes wavefront data and intelligently iterates possible refractions until the optimal value of a metric (eg, the Visual Strehl),[7] which strongly correlates with visual performance, is determined.[8] This appears to be a highly accurate and precise measure of refractive error,[9] which may represent a routine measurement in the future.[10] As good as age-old methods of subjective refraction and retinoscopy may be, we should not stop the search for new and better methods. Science will show us what these are.—*Konrad Pesudovs, MD, PhD*

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Amblyopic adult eyes after LASIK

In their article about corrected visual acuity in amblyopic adult eyes after laser in situ keratomileusis,[1] Sakatani and coauthors