

This article has been amended to include a factual correction. An error was identified to its original printing (*J Refract Surg.* 2011;27(1):7-9), which was acknowledged in an erratum printed in the February 2011 issue of the *Journal* (*J Refract Surg.* 2011;27(1):88). The print article and its erratum remain the version of record.

Standardized Graphs and Terms for Refractive Surgery Results

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critical element of peer-reviewed publication is clear communication to the reader and the ophthalmic and medical community. Refractive surgery has the luxury of multiple procedures with multiple outcome parameters that are relevant to clinicians, researchers, and, of course, patients.

This diversity introduces complexity for the reader in evaluating and comparing various procedures as they are applied to various patient populations. For over a decade, the editors of the *Journal of Refractive Surgery* (JRS) and the *Journal of Cataract & Refractive Surgery* (JCRS) have advocated a minimally acceptable level of standardization in reporting results of refractive surgical procedures.^{1,2} This has culminated in a set of criteria that include basic elements that must be reported in every manuscript. To further this goal of clear reporting, the editors of JCRS, JRS, and *Cornea* would like to announce their collaboration in standardizing two aspects of data reporting in refractive surgery.

STANDARD GRAPHS FOR REPORTING OUTCOMES OF REFRACTIVE SURGERY

As a result of collaboration among members of the editorial boards of JCRS and JRS, a set of 6 standard graphs for reporting refractive surgery outcomes (Fig), originally proposed in 2000,³ will be required for all relevant refractive surgical manuscripts. Modified and described more fully in 2009,⁴ these graphs are meant to display core data that should be at the reader's fingertips for quick but meaningful comparative analysis of outcomes of essentially all refractive surgical procedures. A recent revision is the inclusion of a histogram bar graph that displays the magnitude of refractive astigmatism before and after refractive surgery, replacing the defocus equivalent graph.

NEW ABBREVIATIONS FOR VISUAL ACUITY VALUES

A new set of visual acuity terms and abbreviations, as introduced in 2009,⁵ will be used (Table). These are designed to minimize the confusion that can arise from the myriad visual acuity values that can be presented. The unique element of these is the elimination of the

"B" ("best") and "S" ("spectacle") abbreviations. The editors believe that both these modifiers are implied: Authors of course present "best" acuity whether corrected or uncorrected. Likewise, data for corrected acuities are assumed to be "spectacle-corrected" (as opposed to "contact-lens corrected"), unless the authors specify otherwise.

The new abbreviations also account for the increase in studies reporting outcomes of presbyopic patients in which intermediate and near vision are often reported in addition to distance vision. The new abbreviations provide a consistent structure for corrected and uncorrected vision at each distance.

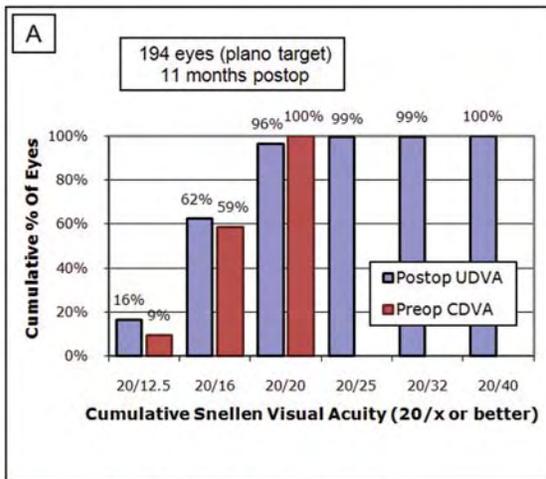
Authors should use the geometric mean when averaging visual acuity data and not an arithmetic mean. Modern visual acuity charts are designed so the letter sizes on each line follow a geometric progression (ie, change in a uniform step on a logarithmic scale); therefore, data should be converted into logMAR values, and a geometric mean is the correct statistical averaging function.^{6,7} These logMAR values can be reported in tables or graphs; appending a Snellen fraction to the logMAR numbers can help readers relate the values to routine clinical nomenclature. All three journals contain a visual acuity conversion chart in each issue to assist readers in converting measurements in logMAR, meters, feet, decimal, and near vision notations.

FUTURE USE OF THE STANDARD GRAPHS

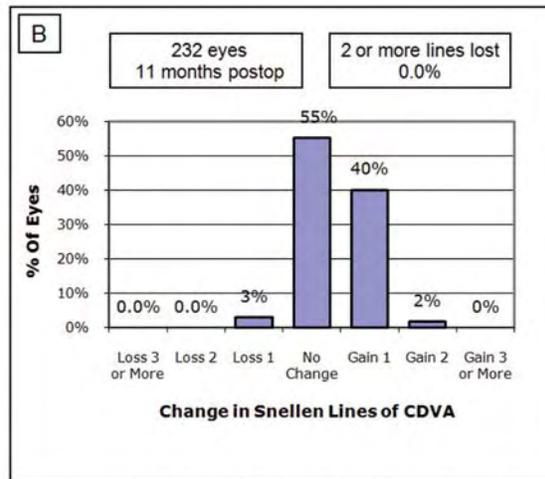
The editorial boards of the *Journal of Cataract & Refractive Surgery*, the *Journal of Refractive Surgery*, and *Cornea* will henceforth require authors to report their outcomes with a minimum standard of displaying the 6 standard graphs for data sets that lend themselves to this form of reporting. To aid authors, an Excel spreadsheet that can be downloaded and used to produce the 6 graphs is available at <http://www.londonvisionclinic.com/refractivessurgeryoutcomes>.

Members of the editorial boards are now refining standard graphic representations of other parameters such as astigmatism and contrast sensitivity.

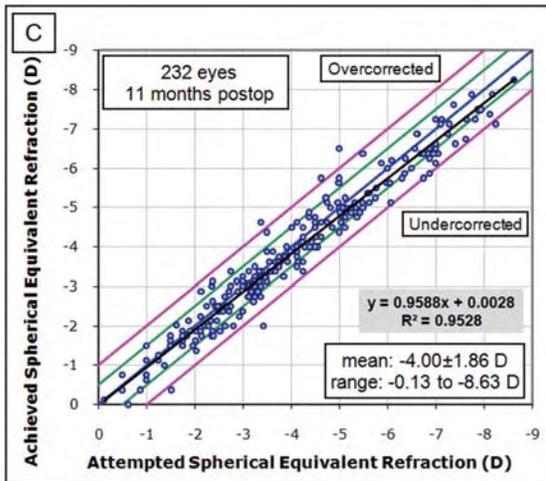
We propose that other ophthalmic journals adopt



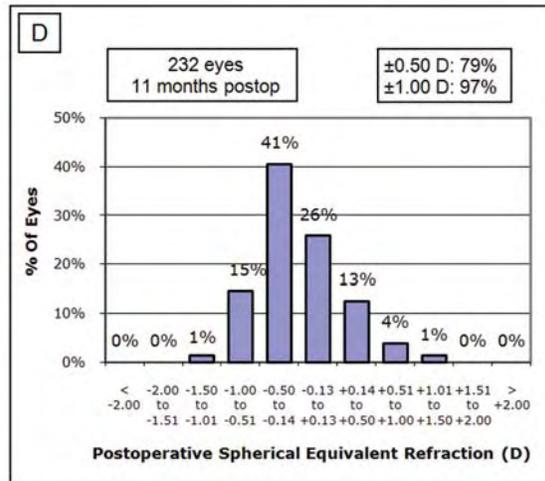
Uncorrected Distance Visual Acuity



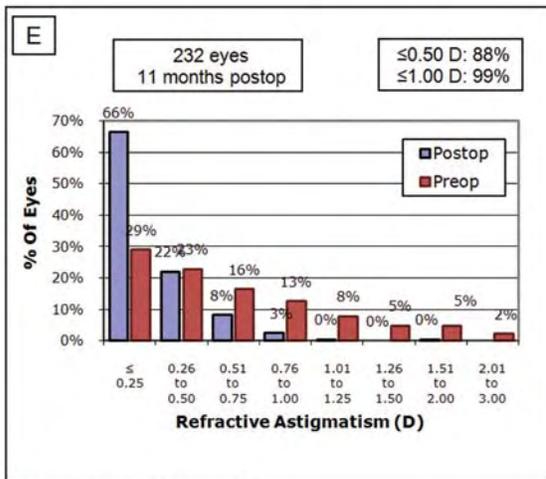
Change in Corrected Distance Visual Acuity



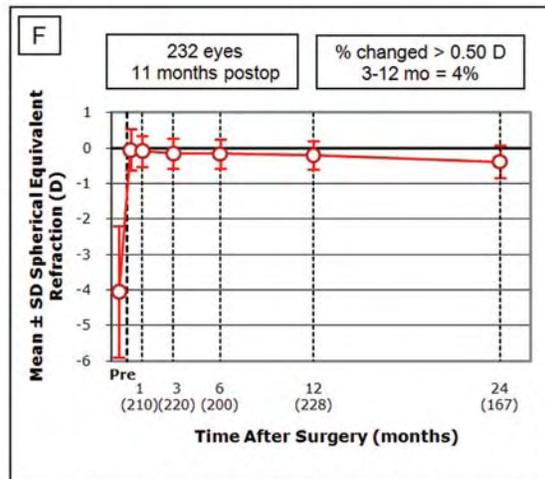
Spherical Equivalent Attempted vs Achieved



Spherical Equivalent Refractive Accuracy



Refractive Astigmatism



Stability of Spherical Equivalent Refraction

Figure. Standard graphs for reporting refractive surgery outcomes (2011). UDVA = uncorrected distance visual acuity, CDVA = corrected distance visual acuity

these standards as a requirement for publishing refractive surgical articles. This ability to compare the results of refractive surgery procedures will improve communication among researchers and clinicians and ultimately foster better outcomes for our patients.

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TABLE

Visual Acuity Terms and Abbreviations

UDVA	uncorrected distance visual acuity
UIVA*	uncorrected intermediate visual acuity
UNVA*	uncorrected near visual acuity
Binocular UDVA	binocular uncorrected distance visual acuity
Binocular UIVA*	binocular uncorrected intermediate visual acuity
Binocular UNVA*	binocular uncorrected near visual acuity
CDVA	corrected distance visual acuity
CIVA*	corrected intermediate visual acuity
DCIVA*	distance-corrected intermediate visual acuity
CNVA*	corrected near visual acuity
DCNVA	distance-corrected near visual acuity
Binocular CDVA	binocular corrected distance visual acuity
Binocular CIVA*	binocular corrected intermediate visual acuity
Binocular DCIVA*	binocular distance-corrected intermediate visual acuity
Binocular CNVA*	binocular corrected near visual acuity
Binocular DCNVA	binocular distance-corrected near visual acuity

*Specify distance at which measurement was made.
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EDITOR'S NOTE

This editorial also appears in the January 2011 issue of the *Journal of Cataract & Refractive Surgery* and will also appear in an upcoming issue of *Cornea*.