

AUTOMATED STANDARD GRAPHS FOR REFRACTIVE SURGERY



A new tool makes reporting outcomes simpler.

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In 1992, Waring introduced the first standards for reporting refractive surgery outcomes with six graphs that show the accuracy, efficacy, safety, and stability of a surgical intervention.¹ The number of graphs was later expanded to nine to address astigmatism.² Similar guidelines were recently developed for lens-based refractive surgery, and the *Journal of Refractive Surgery*, *Journal of Cataract & Refractive Surgery*, and *Cornea* now require these standard graphs for submissions that evaluate refractive surgery outcomes. The AAO's journal

Ophthalmology also recommends the adoption of these graphs in their author guidelines.³

Adhering to these standards helps ensure that the results of various surgical techniques, studies, case reports, and series are formatted consistently and are readily comparable across different studies. Unfortunately, currently available web-based and standalone software solutions are often expensive and require manual data entry or calculations, all of which limits their widespread adoption.

A lack of specialized, free software that can automate the production of standard graphs has hampered ophthalmologists' ability to understand the results of surgical interventions empirically and hindered efficient comparative analyses in the field. In response to these challenges, we developed mEYEstro, a tool to simplify and enhance the accuracy, reproducibility, and standardization of refractive surgery outcomes analysis.

SOFTWARE OVERVIEW

Our aim with mEYEstro is to transform the complexity of refractive surgery data analysis into a seamless, user-friendly experience. Designed specifically for corneal and intraocular procedures, this tool offers automated generation of journal-standard graphs and robust statistical analysis within 30 seconds and with minimal user input. The mEYEstro software has been fully tested, and its results were reported in a peer-reviewed journal.⁴

Core Functionality

The software currently produces 11 standard graphs that fall into four categories (Table). Percent proportions, means, standard deviations, effect sizes, and *P* values are calculated and displayed on each graph. All graphs can easily be exported as high-resolution images

TABLE. CORE FUNCTIONALITY OF MEYESTRO

CATEGORIES	TABLES
Efficacy	Pre- and postoperative cumulative UDVA and CDVA
	Difference between UDVA and CDVA
Safety	Change in lines of CDVA
Accuracy	SEQ to intended target
	Attempted vs achieved SEQ
	DEQ accuracy
	Refractive astigmatism accuracy
	Target induced astigmatism vs surgically induced astigmatism
	Correction index histogram
Stability	Angle of error histogram
	SEQ stability over time

Abbreviations: CDVA, corrected distance visual acuity; DEQ, defocus equivalent; SEQ, spherical equivalent; UDVA, uncorrected distance visual acuity.

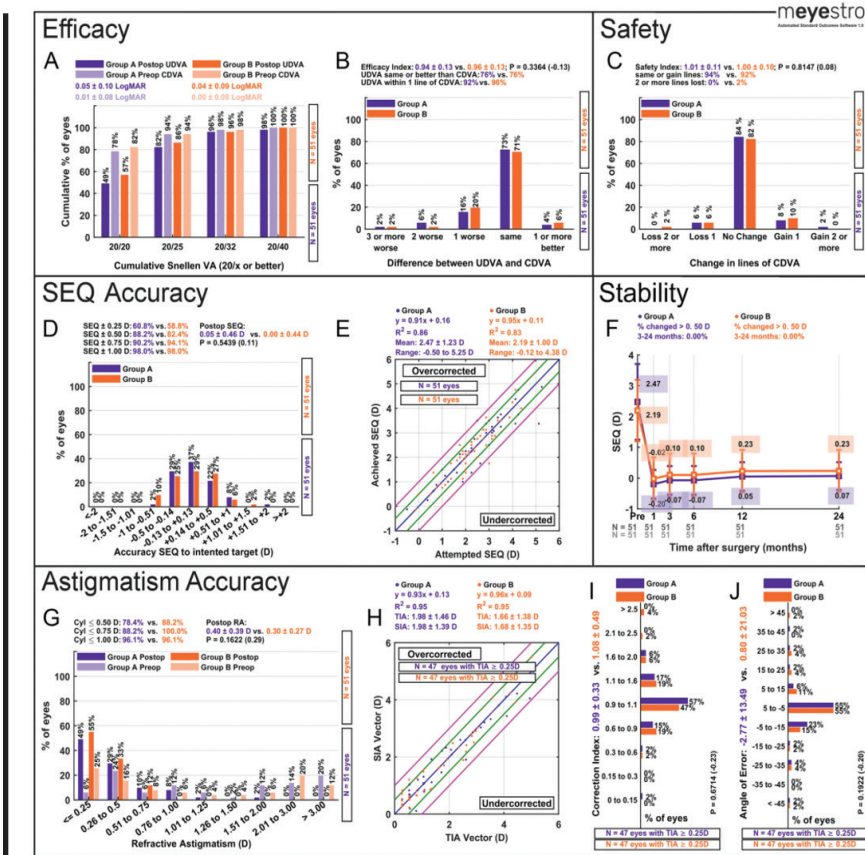


Figure. Graphs were automatically generated by mEYestro from the provided trial 1 dataset. The first simulated trial dataset (trial 1) included two Excel files (groups A and B) and investigated the outcomes of a laser vision correction contralateral eye study comparing two treatment protocols in hyperopic eyes with astigmatism.

to illustrate scientific manuscripts and presentations (Figure).

Program Workflow

The software is controlled with a few simple steps. Users begin by choosing the type of refractive surgery (eg, laser vision correction, refractive lens exchange), the type of study (single group, unpaired groups, paired groups), the name of the groups, and the color of the graphs. Next, they choose the Microsoft Excel (Microsoft) data file that will be imported for each group. The selected graphs

and statistical analyses are then automatically generated and saved in a folder.

PRACTICAL BENEFITS

Refractive surgery analyses are extensive, and subtle nuances cannot be fully captured in a single graphical display. Instead, several graphs are used to answer questions about the efficacy, safety, accuracy, and stability of a procedure. This depth of analysis helps elucidate the cause of inaccurate outcomes and evaluate the effectiveness of treatment.

By simplifying data analysis, this tool can help clinicians and surgeons understand and improve on their outcomes, providing added benefits to patients. The high-resolution images the software generates are appropriate for academic presentations and publications, which makes it easier to share findings with colleagues. Because mEYestro is free to use, it is more accessible than paid alternatives. Further information on mEYestro and our research may be found at www.refractivesturgery.ca. The software may be downloaded at www.lasikmd.com/media/meyestro/index.php or by scanning the QR code. ■



1. Waring GO. Standardized data collection and reporting for refractive surgery. *Refract Corneal Surg.* 1992;8:1-42.
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3. Author information. *Ophthalmology.* Accessed May 31, 2024. www.aajournal.org/content/authorinfo
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