COPE Course Submission — Georgia Optometric Association Fall Conference
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Lecture Title

New Standards in Cataract Surgery: A 2026 Update on Evidence-Based, High-Precision, and Individualized Techniques for Maximizing Outcomes and Safety

Course Description

The intraocular lens (IOL) landscape has changed substantially in the past two years: an evidence-based functional classification of IOLs has been adopted internationally, and three new designs have reached U.S. practice—enhanced monofocal IOLs that modestly extend depth of focus, the first purely refractive extended-depth-of-focus IOL labeled without a loss-of-contrast-sensitivity warning, and the first non-diffractive spiral-optic full-range IOL. This one-hour lecture gives optometrists a practical framework for how each optical design produces its visual effect, what outcomes and trade-offs to expect from each IOL category, and how pre-operative testing should guide candidacy, including in selected patients with glaucoma, retinal disease, or corneal irregularity. Brief updates on femtosecond-laser astigmatism management and intracameral antibiotic prophylaxis, including new randomized-trial evidence, conclude the course.

Course Objectives

Upon completion of this course, the attendee will be able to:

(1) Apply the current evidence-based functional classification of IOLs (monofocal, enhanced monofocal, partial range of field / extended depth of focus, and full range of field) to lenses currently available in the United States, and describe the expected visual outcomes and trade-offs for each category.

(2) Differentiate the optical mechanisms used by current IOLs—diffractive, non-diffractive wavefront-shaping, purely refractive continuous-power, non-diffractive spiral, and higher-order aspheric designs—and explain how each mechanism influences contrast sensitivity, dysphotopsia, pupil dependence, and tolerance to residual refractive error.

(3) Summarize the clinical evidence for the newly available enhanced monofocal, purely refractive extended-depth-of-focus, and spiral-optic full-range IOLs, including contrast-sensitivity, dysphotopsia, and refractive-error-tolerance data.

(4) Identify patients with glaucoma, retinal disease, or corneal irregularity who may now be appropriate candidates for depth-of-focus–extending IOLs; describe the pre-operative testing (macular OCT, visual fields, corneal topography, ocular surface assessment) used to make that determination; and describe where light-adjustable lens technology fits for patients with prior refractive surgery or unpredictable biometry.

(5) Describe the evidence supporting femtosecond-laser astigmatism management and intracameral antibiotic prophylaxis at the time of cataract surgery, including the magnitude of post-operative endophthalmitis reduction reported in large randomized and registry studies.

Course Outline (60 minutes)

I. **Introduction and speaker perspective** (2 min)
   a. Individualization: advanced-technology IOLs are a tool, not a default; pathology is not an absolute disqualification
   b. Why the landscape has changed since 2024: new lens categories and a new international classification

II. **A new framework: the evidence-based functional classification of IOLs** (7 min)
   a. Origin: ESCRS Functional Vision Working Group (2024), adopted as a global consensus with ASCRS, APACRS, and LATAMSCRS (2026)
   b. Four functional categories: monofocal, enhanced monofocal, partial range of field (extended depth of focus, EDOF), full range of field (trifocal and hybrid designs); classification by depth-of-field range and defocus-curve shape
   c. Optical mechanisms and how they map onto the categories
      i. Diffractive (echelette / multi-zone) optics: light splitting, discrete foci, highest near performance, highest dysphotopsia
      ii. Non-diffractive wavefront-shaping optics: elongated single focus, modest contrast cost
      iii. Purely refractive continuous-power optics: smooth posterior-surface power gradient, no rings, no light splitting
      iv. Non-diffractive spiral optics: a continuous spiral surface profile producing a full range of focus without steps or rings; no loss of transmitted light
      v. Higher-order aspheric (spherical-aberration) designs: slight depth-of-focus extension on a monofocal platform
   d. Reading defocus curves: what the shape tells you about intermediate, near, and the "sweet spot"

III. **Enhanced monofocal IOLs: the no-compromise step up from a standard monofocal** (6 min)
   a. First-generation enhanced monofocal (higher-order aspheric design): approximately one line of additional intermediate vision, dysphotopsia comparable to a standard monofocal
   b. New in 2026: an enhanced monofocal using central refractive power modulation on a glistening-free hydrophobic acrylic platform
      i. Design intent: extend depth of focus while preserving distance image quality across pupil sizes and lighting conditions
      ii. Bench data versus a standard monofocal and versus the first-generation enhanced monofocal; what clinical data are still pending
      iii. Toric availability
   c. Role in practice: motivated patients who are poor candidates for premium optics; enhanced mini-monovision; not a "premium" charge

IV. **Extended-depth-of-focus IOLs and the arrival of purely refractive EDOF** (12 min)

a. Established EDOF designs: diffractive EDOF and non-diffractive wavefront-shaping EDOF—expected visual range, contrast trade-off, dysphotopsia profile
b. The purely refractive EDOF IOL (U.S. approval March 2026)
    i. Mechanism: continuously varying posterior-surface power with an aspheric anterior surface; pupil-independent; no diffractive structures
    ii. Pivotal U.S. randomized masked trial versus an aspheric monofocal: comparable distance acuity, superior intermediate acuity, some near gain
    iii. Randomized comparison versus the first-generation enhanced monofocal: superior distance-corrected intermediate and near acuity
    iv. Contrast sensitivity within clinically meaningful limits of an aspheric monofocal; the first U.S. EDOF labeling without a loss-of-contrast-sensitivity warning
    v. Dysphotopsia profile: approximately 97% report no very bothersome halos, glare, or starbursts
    vi. Tolerance to residual refractive error: approximately 94% maintain 20/25 or better within ±0.50 D defocus
    vii. Toric version indicated for ≥1.0 D corneal astigmatism
c. Positioning: where purely refractive EDOF sits relative to enhanced monofocals, wavefront-shaping EDOF, and full-range designs; honest limits on near vision

V. Full-range-of-field IOLs: update (6 min)

a. Diffractive trifocals and the next-generation trifocal with improved light utilization (reduced scattered light)
b. Hybrid diffractive full-visual-range design: continuous defocus curve, improved forgiveness of residual refractive error
c. New in late 2026: the first non-diffractive spiral-optic full-range IOL (standard and toric)
    i. Mechanism: continuous spiral surface profile rather than concentric diffractive steps; design intent is a smooth defocus curve without the "wave" pattern of trifocals
    ii. Evidence to date: international multicenter experience and the U.S. randomized IDE study versus a monofocal control; early dysphotopsia data are favorable but U.S. clinical data remain limited
    iii. Practical considerations: hydrophilic acrylic material and implications for patients who may need future intraocular air or gas; how a non-diffractive full-range option may fit between purely refractive EDOF and diffractive trifocals
d. Expectations: spectacle independence is achievable, but glare and halos are expected, refractive targets must be met, and the eye must be otherwise healthy
e. Mixing-and-matching strategies (off-label use; disclosed as such) and the concept of neuroadaptation

VI. Advanced-technology IOLs in ocular pathology—who qualifies now? (10 min)

a. Glaucoma: a population previously excluded from most presbyopia-correcting optics
    i. Why contrast sensitivity, not acuity, has been the limiting factor; why light-splitting optics remain inappropriate in glaucomatous eyes
    ii. How a contrast-neutral, pupil-independent purely refractive EDOF changes candidacy; relevance of miotic pupils and of possible future filtering surgery and refractive shift

iii. Proposed selection criteria: mild, stable, well-controlled disease; no central or paracentral field defect; intact macular ganglion cell layer on OCT; stable ocular surface; realistic expectations
iv. When to stay with a monofocal or enhanced monofocal: moderate-to-advanced disease, progression, anticipated incisional surgery

b. Retinal disease: role of macular OCT; epiretinal membrane, early macular degeneration, and the value of preserving visual reserve
c. Corneal disease: role of topography; treating anterior basement membrane dystrophy, nodular degeneration, pterygium, and dry eye before biometry
d. Light-adjustable lenses: where they fit for prior refractive surgery, unpredictable biometry, and customized monovision; the co-managing optometrist's role in the adjustment and lock-in period

VII. Femtosecond laser-assisted cataract surgery: astigmatism control (4 min)

a. Prevalence of clinically significant corneal astigmatism in the cataract population
b. Manual versus laser arcuate incisions: precision, predictability, and the evidence
c. Advances in axis registration (iris/vessel registration for cyclotorsion) and the "refractive capsulorhexis"

VIII. Intracameral antibiotics: the new era of post-operative safety (8 min)

a. Foundational evidence: the ESCRS Endophthalmitis Study (n = 16,603)—approximately five-fold reduction in endophthalmitis with intracameral cefuroxime; confirmatory meta-analyses
b. Intracameral moxifloxacin: randomized trial (n = 3,640) showing a 7.6-fold higher rate without intracameral prophylaxis; registry data from more than two million consecutive surgeries
c. New in 2026: the largest randomized trial to date (approximately 60,000 eyes)—post-operative endophthalmitis 0.02% with intracameral moxifloxacin versus 0.05% with topical prophylaxis alone
d. Agent comparison (cefuroxime, moxifloxacin, vancomycin): efficacy, toxic anterior segment syndrome, macular toxicity, and allergy considerations
e. Regulatory status: no intracameral antibiotic is FDA-approved for endophthalmitis prophylaxis in the United States; all such use is off-label and will be disclosed as such
f. Practical guidance: what to ask your consulting surgeons

IX. Summary, co-management pearls, and questions (5 min)

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