



THE FUTURE OF SURGICAL TRAINING

A paradigm shift in ophthalmology.

BY IVO FERREIRA RIOS, MD, AND CRISTOS IFANTIDES, MD, MBA

Dr. Atere Cheirourgos stands in the OR, his heart pounding as he prepares to make a crucial decision in a highly complex cataract surgery case. Every movement must be precise; every decision is critical. Despite the high stakes, he remains composed by deploying the coping strategies he has practiced. His hands execute the procedure with flawless dexterity.

Suddenly, he removes his headset, and the OR disappears. He is not in a hospital but a high-fidelity simulation lab. It is the year 2036, and Dr. Cheirourgos is a surgical resident completing his 4,000th simulated case before ever stepping into a real OR.

We believe a new standard of surgical training can ensure every ophthalmologist achieves competency and mastery before performing live surgery.

THE PROBLEM: A BROKEN AND INEFFICIENT TRAINING SYSTEM

Traditional training models for cataract surgeons rely heavily on live patient experience and require years of mentorship, observation, and progressive responsibility. The variability in training opportunities and case exposure leaves many residents inadequately prepared for independent practice.

The traditional approach to surgical training is inefficient, often

resembling an apprenticeship model rather than a structured and reproducible curriculum. It also is not scalable: each year, 1,000 US surgeons retire, and only 500 new surgeons are produced. The reliance on live patient training, moreover, introduces ethical dilemmas because patients essentially become part of a learning curve. Additionally, the stress of early surgical experiences can negatively affect learning, increasing anxiety and reducing performance.

LESSONS FROM OTHER INDUSTRIES: THE POWER OF SIMULATION

The aviation industry recognized similar inefficiencies decades ago.

No pilot begins their first real flight without completing extensive simulation training. Buzz Aldrin, one of the astronauts on the Apollo 11 mission, demonstrated the effectiveness of simulation when his heart rate never exceeded 100 beats per minute during the launch of one of the most dangerous and significant flights in history.¹ Why? He had already completed the mission hundreds of times in a simulated environment.

Similarly, Formula 1 drivers complete extensive simulation training before stepping into a real race car. Simulations allow them to experience track conditions, refine their reaction times, and practice emergency maneuvers under controlled settings.

Military and law enforcement personnel rely on simulation-based training to prepare for high-stakes, unpredictable situations. Studies have shown that soldiers trained in immersive combat simulations make better decisions under pressure and have reduced stress responses when facing real-world combat.²



Figure. A resident hones their surgical and stress management skills during a high-fidelity simulation training case at Oftalmo University.

“The future belongs to structured mastery that ensures every surgeon is not only competent but exceptional before they enter an OR.”

SIMULATION IN OPHTHALMOLOGY: THE SHIFT HAS BEGUN

The specialties of anesthesiology and emergency medicine are pioneering the use of simulation training in medicine. A study found that anesthesiology residents trained on high-fidelity simulators performed significantly better in crisis scenarios compared to their traditionally trained counterparts.³ Similar studies in trauma surgery have shown that simulation-trained teams responded more effectively to emergencies, with improved patient outcomes and reduced medical errors.⁴

Forward-thinking ophthalmology educators have begun integrating simulation-based training into the curriculum. The use of high-fidelity surgical simulators allows residents to develop psychomotor skills, cognitive decision-making, and problem-solving abilities before ever touching a real patient.

Oftalmo University, where one of us (I.F.R.) practices, has implemented a structured curriculum that mimics the best training principles from aviation and elite performance coaching (Figure; scan the QR code to watch a video). The school’s methodology focuses on three areas:

▶ **No. 1: Psychomotor skills.** Residents receive training in precise manual dexterity and instrument handling.

▶ **No. 2: Cognitive skills.** Trainees’ decision-making ability is enhanced through structured problem-solving frameworks and algorithms.

▶ **No. 3: Mindset mastery.** Residents are taught focus management, anxiety control, and emotional intelligence so they can thrive in high-stress environments.

The results achieved since the new curriculum was implemented have been extraordinary. Residents who have completed more than 1,000 simulation cases have demonstrated significantly higher competency, confidence, and decision-making capabilities than those trained with traditional models. The former group has exhibited less anxiety and achieved better outcomes when transitioning to live surgery.

THE FUTURE OF SURGICAL TRAINING: STANDARDIZED EXCELLENCE

Surgical training should be built on a systematic, evidence-based curriculum that ensures every surgeon reaches peak performance before operating on live patients. Our goal is for all surgical residents to achieve mastery through the following steps:

▶ **Comprehensive simulation training.**

Residents practice every step of cataract, cornea, glaucoma, and retina procedures thousands of times in high-fidelity environments.

▶ **Personalized learning paths.**

AI-driven analytics guide residents through tailored skills development based on real-time performance data.

▶ **Mental and physical optimization.**

Surgical training covers not only



technical skills but also stress management, focus, and overall well-being to improve residents' resilience.

A CALL TO ACTION

We believe the transition to simulation-based training in ophthalmology is no longer a question of if but when. It is up to institutions, educators, and industry leaders to embrace the future and commit to training the next generation of surgeons with the highest standards of excellence. The future belongs to structured mastery that ensures every surgeon is not only competent but exceptional before they enter an OR. ■

The authors would like to thank Bonnie Henderson, MD, for her feedback.

1. Aldrin B, Abraham K. *Magnificent Desolation: The Long Journey Home from the Moon*. Crown Publishing Group; 2009.
2. Orvis KL, Horn DB, Belanich J. The effectiveness of simulation-based training for developing adaptive decision-making skills. *Mil Psychol*. 2008;20(1):1-18.
3. Issenberg SB, McGaghie WC, Petrusa ER, Gordon DL, Scalese RJ. Features and uses of high-fidelity medical simulations that lead to effective learning: a BEME systematic review. *Med Teach*. 2005;27(1):10-28.
4. Steinemann S, Berg B, Skinner A, et al. In situ, multidisciplinary, simulation-based teamwork training improves early trauma care. *J Surg Educ*. 2011;68(6):472-477.

IVO FERREIRA RIOS, MD

- Ophthalmologist, Barcelona, Spain
- Cofounder and CEO, Oftalmo University, Mexico City
- Financial disclosure: Consultant (Alcon, Essilor-Luxottica, Haag Streit Simulation)

CRISTOS IFANTIDES, MD, MBA

- Private practice, Tyson Eye, Cape Coral, Florida
- Adjunct Assistant Professor, Sue Anschutz-Rodgers Eye Center, University of Colorado, Aurora, Colorado
- Member, *CRST* Editorial Advisory Board
- cristosmd@gmail.com; X @GatorCristos; Instagram @cristosifantides
- Financial disclosure: Advisor (Centricity Vision, EyeCool Therapeutics); Consultant (Alcon, Carl Zeiss Meditec, Lensar); Investor (Horizon Surgical Systems); Research support (Alcon, Bausch + Lomb, Carl Zeiss Meditec, Centricity Vision, Johnson & Johnson Vision, Lensar); Stock (Bausch + Lomb, EyeCool Therapeutics, Lensar)