

# Current Perspective

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## Intelligence: Artificial and/or Human

**A**rtificial intelligence (AI) has been widely predicted to change physician work by employing predictive analytics and powering tools that support clinical decision making.

Imagine a 35-year-old Asian woman with Harada's disease on an anti-inflammatory biologic medication with a visually significant cataract. What outcomes can be anticipated with cataract surgery? Traditionally, most ophthalmologists would either call a knowledgeable colleague or search for a recent article on the subject. We would then likely receive either an "expert anecdote" or a small case series that is several years old. By contrast, the combination of clinical decision-support tools, married to a clinical data registry and predictive analytics, might—in a matter of a few minutes—tell you that "of the last 200 Asian women under age 40 on biologics who underwent cataract surgery, X% achieved a visual acuity at 6 months of 20/50 or better and involved treatment with drug Y." Such current and exquisitely specific information could rapidly become invaluable. We've all suffered from cognitive overload. Now we have "artificial" help.

But what of AI's disruptive impact on current models of practice? Most shoes used to be purchased at shoe stores. Now, an increasing percentage are ordered online, and they can be returned for a different size, style, and color. Will glasses become like shoes? And why shouldn't they? But what will be the impact on the ophthalmologist or the optometrist—not just in lost revenue but in dealing with the problems inherent in the process?

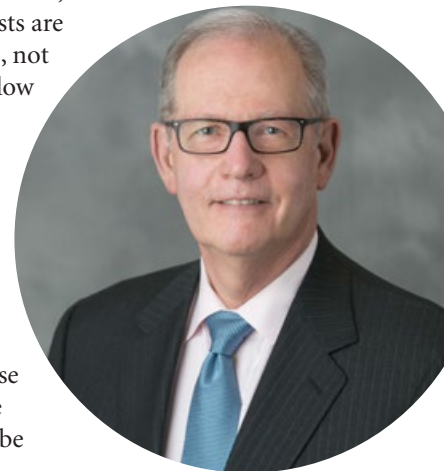
How will the diabetic care process be impacted by a technology and analytics platform wherein computer-based image analysis of a single fundus image taken in a pharmacy immediately provides not only retinopathy status but also glycosylated hemoglobin level and cardiovascular risk assessment? That technology exists.

How would the model of macular degeneration (AMD) care be affected by home OCTs (another technology under development)? Does this mean that AMD care only requires an injector? What does it mean for the ophthalmologist? Does patient empowerment necessarily precipitate physician disempowerment? I don't think so, but I do think that technology will fuel greater patient engagement. Consider

patient-initiated whole genome sequencing. Based on recent trends, this will soon cost only a few hundred dollars. Examined in isolation, it has limited utility. However, its relevance for patients multiplies when combined with individual clinical and phenotypic information from the electronic health record—and with population-based data from registries!

An analogy has been made to cruise control. We've gone from cruise control to adaptive cruise control to automatic braking for collision avoidance to driverless cars. Advanced imaging and analytics have made this possible. Does this mean that physicians, like drivers, will have far reduced roles and authority? I doubt it. Consider radiology. Its professional demise has been widely predicted for years as images are interpreted by computer. In fact, health care is complicated. Radiologists are assisted by the data processors, not replaced by them. Their workflow has changed. AI can generate probabilities and suggest diagnoses. But AI cannot replace the relationships that physicians develop with patients—which allow us to guide them through the personal risk-benefit trade-offs that characterize clinical disease management. The importance of human intelligence cannot be dismissed.

The ophthalmologist of tomorrow will integrate not only diagnostic information obtained in the office but also information gleaned from wearables and home devices, patient-initiated imaging and genomics, registry-assisted population health information integrated into predictive analytics, and finally the clinical information from face-to-face patient encounters. Our role will evolve; our skill set will evolve; but we will not be supplanted purely by artificial intelligence and technology. AI, by incorporating new datasets, and enriching the analytics, will make physicians more necessary—not less.



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