# Emerging technologies revolutionising ophthalmology

BY KHALED SAQQAW

Advancements in ophthalmology have significantly transformed eyecare practices. This article explores five emerging technologies that are revolutionising the field, from virtual reality (VR) surgical training to novel therapies for corneal conditions. These innovations are reshaping how eyecare professionals diagnose, treat and manage various ocular diseases.

## SIDICS: Sustainability index for cataract surgery packs

sidics
Sustainability Index for Disposables in Cataract Surgery

*Image courtesy of ESCRS.*

As sustainability gains traction in healthcare, tools like the Sustainability Index for Cataract Surgery (SIDICS), created by ESCRS, are leading the charge towards eco-conscious practices in ophthalmology [2]. SIDICS empowers hospitals and surgical centres to assess the environmental footprint of their cataract surgery packs, pinpointing avenues for cutting carbon emissions. By fine tuning the choice of disposable items and curbing waste generation, healthcare facilities play a pivotal role in the global fight against climate change while upholding top-tier patient care standards.

To elaborate on how SIDICS works, users input the number of cataract packs ordered annually and select the components they currently include or wish to include in their packs. Based on recommended sustainable configurations, the tool then calculates potential $CO_2$ savings. Additionally, industry players can incorporate their products' $CO_2$ data to gauge their impact on carbon footprints. This data-driven approach arms healthcare providers with actionable insights that may be helpful for immediate ordering decisions.

Sustainability Index for Cataract Surgery serves as a mechanism to assess the sustainability of tailored cataract kits utilised in hospitals and surgical facilities.

## Orbis and FundamentalVR's VR solution for ophthalmic surgical training

orbis
FUNDAMENTALVR

*Fundamental VR being used by a resident at First Central Hospital, Mongolia.*

*Credit: Geoff Oliver Bugbee / Orbis.*

Virtual reality training devices have revolutionised surgical education, offering surgeons immersive simulations to refine their skills in a risk-free environment [1]. A standout example is the VR solution by Orbis and FundamentalVR, designed specifically for training ophthalmic surgeons in procedures like cataract surgery. This innovative tool not only provides cost-effective and portable training but also aims to democratise access to high-quality surgical education. Its tailored approach is especially crucial in regions with limited access to eyecare, particularly in low- and middle-income countries. The solution integrates VR, haptic feedback, and cloud-based assessment data, offering a comprehensive training experience for eyecare professionals. Moreover, its use of affordable gaming hardware makes it accessible to resource-restricted partners, enhancing its reach and impact [1].

This VR solution works by immersing trainees in highly realistic surgical simulations, where they can practise and refine their skills through virtual procedures. The incorporation of haptic feedback provides tactile sensations, enhancing the realism of the experience. and allowing trainees to develop a deeper understanding of surgical techniques. Additionally, cloud-based assessment data enables trainers to track trainee progress and provide targeted feedback for improvement, further enhancing the effectiveness of the training program. Overall, the integration of VR, haptic feedback, and cloud-based assessment data creates a comprehensive and accessible training solution for ophthalmic surgeons, with the potential to significantly improve surgical outcomes and patient care.

## Updated laser ablation algorithm for myopia and myopic astigmatism


*Images courtesy of Bausch + Lomb.*

Laser refractive surgery, a longstanding solution for myopia and astigmatism, has recently advanced with the Food & Drug Administration (FDA) approval of the Teneo 317 Model 2 excimer laser by Bausch + Lomb [3]. This cutting-edge laser offers unprecedented speed and precision, treating a diopter in just 1.2 seconds without the need for nomograms or physician adjustments. The Teneo excimer laser is capable of correcting myopic astigmatism up to -10.00D MRSE, with a sphere between -1.00D and cylinder between 0.00 and -3.00D in individuals aged 22 years and older [4]. The advanced eye tracker, operating at 1740Hz,

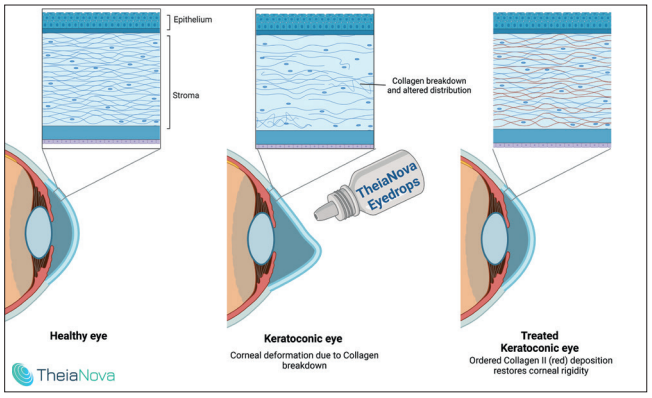
ensures that the laser ablation pattern remains unaffected by patient eye movements, significantly reducing the risk associated with such movements [4]. Results from FDA trials show exceptional outcomes, with 98% of patients achieving vision greater than 20/25 and over half achieving 20/16 or better [3]. With near-zero manifest refractive spherical equivalent observed at nine months post-operation and improvements in contrast sensitivity, this technology promises a new standard of care for refractive surgery patients [3].

## Arx Gen 1.5 wearable headset with bone conduction speakers


*Image courtesy of ARxVision LLC.*

Wearable technology, epitomised by devices like the ARx Gen 1.5 headset, marks a paradigm shift in assisting individuals with visual impairments. By integrating bone conduction speakers, these headsets provide users with real-time auditory descriptions of their surroundings, thereby enriching their spatial awareness and navigation abilities [5]. Harnessing the power of augmented reality (AR) and artificial intelligence (AI), these devices offer hands-free access to visual information, empowering users to interact with their environment more independently and confidently. Through cutting-edge image recognition algorithms, these headsets can seamlessly identify objects, decipher text, and provide contextual information, delivering a remarkably intuitive experience for users. From facilitating indoor navigation to enabling object recognition, the fusion of ARxVision, Seeing AI, and NaviLens technologies in wearable headsets promises to profoundly enhance the quality of life for individuals with visual impairments.

## TheiaNova's therapy for keratoconus and corneal ectasia




*TheiaNova's eyedrops induce keratocytes to produce collagen. TheiaNova's products have not yet been approved for clinical use in any jurisdiction.*

Innovative therapies for corneal conditions like keratoconus and corneal ectasia are offering new hope for patients with progressive vision loss. TheiaNova's eye drop formulation represents a promising advancement in the treatment of these conditions, harnessing the power of dexamethasone sodium phosphate and transforming growth factor beta three to promote collagen production in the cornea [6]. By strengthening and stabilising the corneal tissue, this therapy has the potential to halt disease progression and improve visual outcomes for patients. With ongoing research and development efforts, such novel treatments are reshaping the treatment landscape for corneal disorders. TheiaNova's initiative to raise $10 million for upcoming clinical trials demonstrates their commitment to advancing the treatment of keratoconus and corneal ectasia [7]. With promising data from a proof-of-concept study anticipated later this year in New Zealand, TheiaNova aims to conduct phases 1 and 2 clinical trials to further evaluate the safety and efficacy of their therapy [8]. If successful, this non-invasive eye drop treatment could provide a groundbreaking solution for individuals living with keratoconus, offering hope for improved vision and quality of life.

In conclusion, these emerging technologies are poised to revolutionise ophthalmology by enhancing surgical training, improving refractive outcomes, empowering visually impaired individuals, promoting sustainability in healthcare, and advancing the treatment of corneal conditions. As these innovations continue to evolve, they hold the promise of ushering in a new era of precision, accessibility, and sustainability in eyecare.

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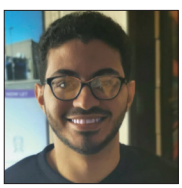

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