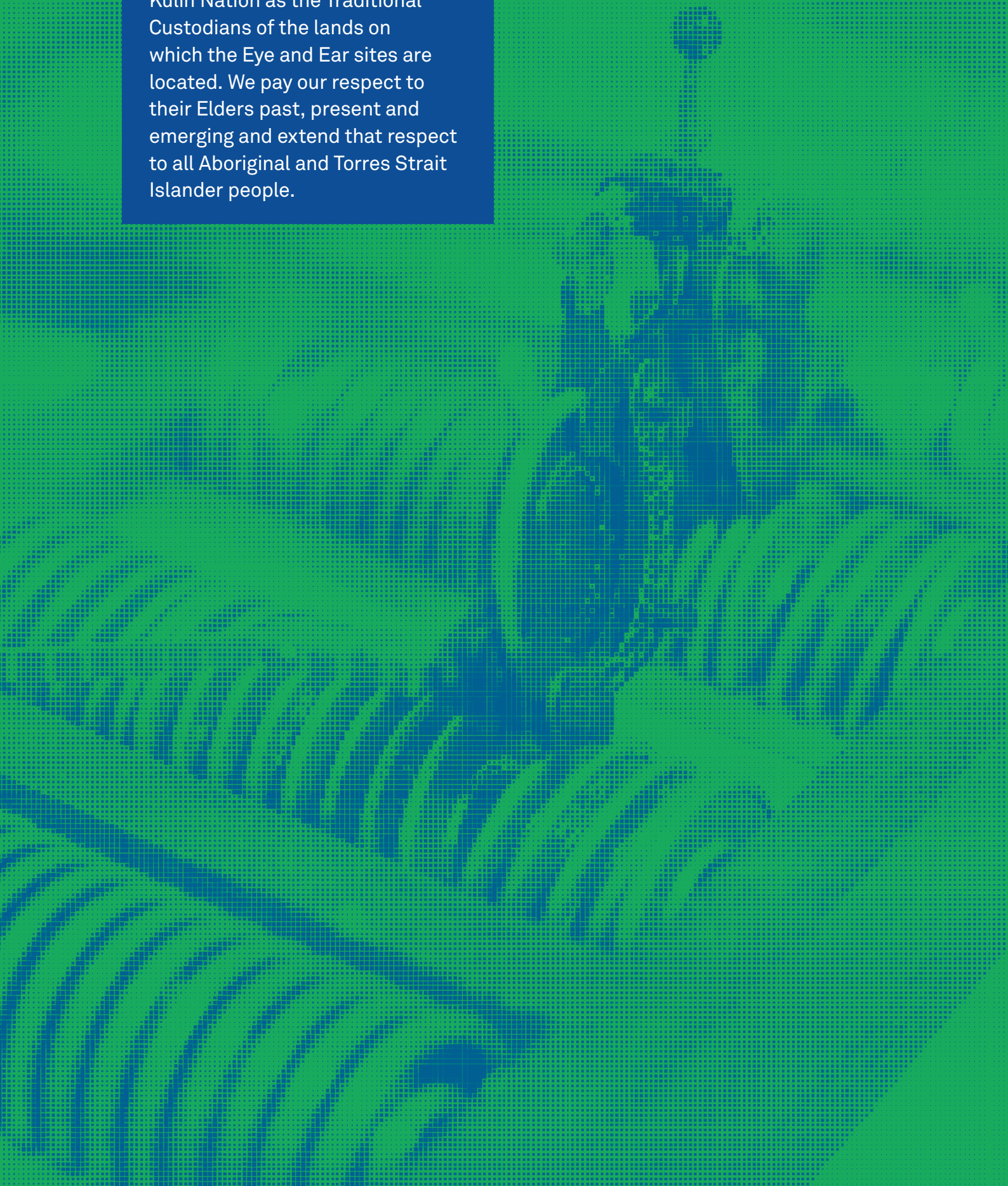
innovate

Annual Review
2020–21

the royal victorian
eye and ear
hospital

The Royal Victorian Eye and Ear Hospital respectfully acknowledges the people of the Kulin Nation as the Traditional Custodians of the lands on which the Eye and Ear sites are located. We pay our respect to their Elders past, present and emerging and extend that respect to all Aboriginal and Torres Strait Islander people.



Contents

Welcome

Chair's welcome

On behalf of The Royal Victorian Eye and Ear Hospital and its Board, I am pleased to present the 2020–21 Annual Review.

As we reflect on the past year, with all of its challenges, it is pleasing to see year on year how much we grow and develop as we continue to serve our patients and the community more broadly. The agility displayed by the hospital in response to COVID-19 is commendable. While battling the uncertainties of the pandemic, we have continued to enhance our clinical services to deliver the safest, best quality care to our patients and their families.

As the healthcare sector adapts to a new normal, the Eye and Ear continues to work in partnership with other service providers, supporting research into new treatments and growing clinical services. It is those stories that we present to you as part of this publication.

World-leading research

In the past year we undertook 277 research projects with our partners, including the Centre for Eye Research Australia (CERA), the University of Melbourne, the Bionics Institute, Bionic Vision Australia, HEARing Cooperative Research Centre and Monash University.

Research highlights include:

- investigating a new treatment for Fuchs' endothelial dystrophy (FED) whereby patient vision is improved without the need for a corneal transplant
- the development of new piezoelectric implantable hearing technology, and
- trial monitoring of glaucoma at home using a smartphone device, which has been particularly relevant during the pandemic.

Sharing our knowledge

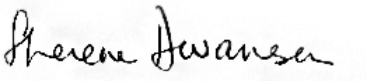
The hospital has positioned itself as a leader in ophthalmic care services and innovation across the world. On the international stage via the World Association of Eye Hospitals (WAEH), we shared our expertise in alternate post-operative models, community outreach, and our COVID-19 response. I am pleased to observe how the hospital's reputation continues to flourish as we continue our journey to be a world leader providing exceptional care.

Innovative future

The hospital redevelopment has achieved major milestones this year, and as the momentum builds, we are on track to deliver a better hospital for our patients, staff and visitors by mid 2022. Alongside the redevelopment accomplishments, the hospital introduced the electronic medical record system and rolled out a digital patient check-in service. The delivery of these projects showcases the hospital's commitment to the whole patient journey. The hospital's willingness to lead through technology both improves the experience of the patient and builds increased efficiencies.

It has certainly been a unique year and we are proud to have overcome the many challenges without compromising our patient centred approach.

I would like to thank all our partners, stakeholders, and collaborators. As you read the Annual Review, I hope you feel inspired by the work of The Royal Victorian Eye and Ear Hospital which improves the lives of patients across Victoria.



Dr Sherene Devanesen
Chair, Board of Directors

The new Eye and Ear

In 2020–21 the hospital redevelopment project made significant progress towards completion in 2022. Key milestones achieved to date include:

- opening a new reception and security area on our main site
- relocation of the Sterile Processing Service (SPS) and Operating Theatre Suite theatres
- infill building structure complete with façade installation nearing completion.

During the peak of the COVID-19 pandemic in 2020, building works continued at a reduced capacity, and with the ever-changing environment, the hospital continued to provide vital eye, ear, nose and throat patient care services to the community.

The redeveloped hospital will make navigation and connections between our existing two hospital towers significantly easier, increase natural light in the buildings, and overall make the hospital more pleasant for patients, visitors and staff.


HANSEN YUNCKEN
the royal victorian eye and ear hospital
VICTORIA
State Government


Way out
Cashier
Pharmacy

We lead innovation in new and emerging research, care and treatment modalities, in conjunction with our research partners.

Innovation and research

FED trial reduces the need for a corneal transplant

A new treatment being investigated for the hereditary eye condition, Fuchs' endothelial dystrophy (FED), is improving patients' vision without the need for a corneal transplant.

Fuchs' dystrophy is a disease of the cornea – the clear front window of the eye - where cells in the corneal layer called the endothelium stop working. These cells normally pump fluid from the cornea to keep it clear but when they stop working, fluid builds up, the cornea swells, and vision becomes cloudy. Protein spots called guttatae also build up on the endothelium, degrading vision.

FED mainly affects people in their 50s and older. Often, people describe their vision as cloudy or hazy and the condition worsens until they gradually lose vision.

Patient Helen Aarons discovered her Fuchs' endothelial dystrophy while presenting at a routine optometrist appointment in early 2019. Helen was experiencing symptoms commonly attributed to cataracts, and she did in fact have cataracts, however Helen also had FED.

Currently, the only treatment is a corneal transplant where the diseased endothelial layer is removed and replaced with a donor cornea which has a healthy endothelial layer. This leads to an improvement in vision. FED is one of the most common reasons for a corneal transplant in Australia.

Ophthalmologists Associate Professor Elaine Chong and Dr Elsie Chan are leading a trial for a new treatment for FED at the Eye and Ear and the Centre for Eye Research Australia (CERA).

They hope the new treatment, which enables the cornea to heal on its own, can become an alternative to a corneal transplant.

The new treatment involves an operation to remove a small area of unhealthy endothelial cells from the centre of the cornea. This encourages healthy endothelial cells from untouched areas of the cornea to move into the centre of the cornea, leading to recovery of the cornea.

"We remove a four-millimetre area of Descemet's membrane along with its diseased endothelial cells, without inserting a corneal transplant," Associate Professor Chong explained. "This procedure is called Descemetorhexis Without Endothelial Keratoplasty (DWEK) or Descemet's stripping only (DSO.)"

Eye-drops involved in corneal endothelial cell healing - 'rho-kinase inhibitors' - are used in some cases that do not heal on their own to encourage healthy endothelial cells to migrate to the centre of the cornea.

> "At my most recent appointment, they told me I have the cornea of a 20-year-old in my right eye."

The Eye and Ear-CERA team has performed the procedure on 10 patients since the trial began in 2019. It was successful in eight, improving vision and avoiding transplant, while two whose endothelial cells failed to migrate centrally to clear their cornea required transplants.

"DWEK had an 80 percent success rate in our trial with an improvement in visual acuity (clarity of vision) in all patients," Associate Professor Chong said. "It meant they achieved vision as if they had a transplant, but without needing a corneal transplant to do so, and it

stopped progression to blindness. It is too early to say if it is a cure, but it does improve vision. We will need to follow-up our patients for longer to see what happens in the long term."

Helen was one of the successful participants and had the DWEK surgery in her right eye in February 2021. She experienced a successful recovery with most of her healing occurring within the first month.

Helen is now experiencing 20/20 vision in her right eye thanks to the DWEK procedure.

"The best way to describe it is it is like watching an ultra-HD TV in my right eye and an old analogue TV in my left eye – the difference is extremely noticeable!" she said. "At my most recent appointment, they told me I have the cornea of a 20-year-old in my right eye."

"It is the best thing I've done for my eye health. The Eye and Ear staff have been wonderful and made my experience a really positive one. The outcome is much better than I ever imagined. If the procedure gets rolled out, I will book in my left eye in a heartbeat," Helen explained.

Associate Professor Chong said: "A few other research groups have performed the procedure and have similarly found that DWEK can clear FED, but our study aims to recruit more patients and follow them for longer, for at least two years.

"We are still refining our understanding to find which patients are suitable and who requires eye drops. More studies are needed to establish the clear role of DWEK in the management of FED."

↑ IMAGE CAPTION: ASSOCIATE PROFESSOR ELAINE CHONG AND DR ELSIE CHAN LEADING THE FED TREATMENT TRIAL

Better outcomes for Aboriginal and Torres Strait Islander children with otitis media

Middle ear infection or otitis media is endemic among Aboriginal and Torres Strait Islander people with many children experiencing associated eardrum perforation and hearing loss.

Up to one-third of Aboriginal and Torres Strait Islander children suffer a tympanic membrane (eardrum) perforation and related hearing loss that persists into adulthood, affecting education, social and job opportunities.

Research at the Eye and Ear aims to create better outcomes after surgical repair of ruptured eardrums, ensuring hearing is restored and giving these children a better chance in life.

Clinical Associate Professor Jean-Marc Gerard is an ear, nose and throat (ENT) surgeon, head of the hospitals' Otology Unit, works in the University of Melbourne's Otolaryngology Department and is also an ENT consultant at Austin Health.

He advises that frequent and aggressive acute infections can recur, and disease progress to a chronic condition.

"This often leads to burst or pathological ear drum with hearing loss. In advanced presentations, surgery is difficult, and results are not as good," he said.

Research at the Eye and Ear aims to create better outcomes after surgical repair of ruptured eardrums, ensuring hearing is restored and giving these children a better chance in life.

"Surgical repair is the best solution, but a study of 216 Aboriginal and Torres Strait Islander children who had surgery found that despite most having the eardrum closed successfully, hearing improvement was significantly poorer when compared with international norms, and a large percentage did not recover as much hearing as was hoped."

Causes are unknown for this "conductive" hearing loss when the passage of sound is blocked, making it hard to hear soft sounds, and making louder sounds muffled.

"The suspicion is that there is so much scarring of tissue around the ossicle bones in the middle ear because of more frequent and aggressive infection that they don't vibrate well enough to effectively transmit sound from the eardrum through to the inner ear, resulting in more significant hearing deficit," Associate Professor Gerard said.

When performing surgery, the surgeon's fingers are not sensitive enough to detect partial blockage of the ossicles and the surgeon cannot estimate the exact impact on hearing loss from this blockage so does not know whether to repair the ossicle bones.

To try to overcome this obstacle, Associate Professor Gerard and his team developed a system to assess the impact of scarring on the ossicles' mobility. The system measures the "resonance frequency" (natural frequency of vibration) of the ossicular chain, which is an indicator of stiffness and scarring.

"We created a system to determine partial blockage during surgery by attaching a small magnet to one of the ossicles and using an electromagnetic probe to vibrate the magnet," he explained.

"Based on movement of the magnet we can check how much the ossicle bones are moving or blocked and indirectly predict the level of hearing loss.

"If there is a small blockage, we won't risk destroying and rebuilding the ossicles but if there is a significant blockage, we will repair the ossicular chain."

The next step is to validate the efficiency and safety of this system with a clinical trial in specific patients before it can be routinely adopted in Aboriginal and Torres Strait Islander patients and later hopefully benefit patients worldwide.

"We created a system to determine partial blockage during surgery by attaching a small magnet to one of the ossicles and using an electromagnetic probe to vibrate the magnet,"

↑ IMAGE CAPTION: ASSOCIATE PROFESSOR JEAN-MARC GERARD EAR, NOSE AND THROAT (ENT) SURGEON AND HEAD OF THE EYE AND EAR OTOLOGY UNIT

Second-generation bionic eye trial improves navigation at home

In 2012, the bionic eye was born, leading the way for vision loss innovation in Australia. The project was led by CERA, the Bionics Institute, The University of Melbourne, the University of New South Wales and NICTA (Bionic Vision Australia) in collaboration with the Eye and Ear. Fast-forward to 2021, with the completion of second-generation trials, participants can now use the device to perform every-day activities in and out of the home.

Eligible participants for the retina-based technology, developed in partnership with Bionic Vision Technologies, need to have been able to see at some point in their lives. In 2018, four patients started the two-year trial, which included assessment, surgery, device switch on, training to learn how to interpret the device feedback, and, testing in and out of the home.

The hospital has been instrumental in preparing for the first-in-human surgeries, and in post-operative care of participating patients. When developing the surgical approach, the trial saw a unique collaboration between eye surgeons and ENT surgeons. In particular, Professor Robert Briggs and his extensive experience with cochlear implants made this collaboration successful.

“It’s an absolute privilege to be a part of this trial as I see this as history making. It has been an opportunity for me to help improve the lives of other vision-impaired people in the future,”

Associate Professor Penny Allen, who led the surgical team that implanted Australia’s first bionic eye, explained: “The patients that volunteer to be a part of the trial are incredibly altruistic. While optimistic, we weren’t sure if the bionic eye would work for them and could not provide this guarantee during the consent process. The main driver for them was to help other people and pave the way for the future.”

Trial participant Colleen Knowles was born with Cone-rod dystrophy, a condition that affects the retina, and wore glasses when she was a child. In her teens she had about 20 percent vision, but it wasn’t until Colleen hit her early 30s that she realised the full severity of her vision loss and decided to seek assistance. This is when she received her first guide dog.

“It’s an absolute privilege to be a part of this trial as I see this as history making. It has been an opportunity for me to help improve the lives of other vision-impaired people in the future,” Colleen said.

The second-generation device aims to create a ‘sense of vision’ for the participants, enhancing their visual experience alongside the use of their regular aid - a cane or a guide dog - ultimately improving their overall navigation and increasing their independence.

“Essentially, the device takes video from a small camera attached to the glasses; this information is then converted into electrical stimulation that travels via a lead to the device implanted within the eye, stimulating the residual retinal tissue. The brain then interprets this as different flashes of light,” explained Associate Professor Allen.

After surgery at the Eye and Ear and a successful recovery, it is time to switch on the device to understand if it has worked for each participant.

“Switch on day was very exciting,” Colleen said. “I was worried it hadn’t worked and then all of a sudden, there it was, I could see it, the flashes of light appeared. From then, it was all about learning to interpret the light, depending on its shape, size, and brightness. Over time, more often than not, I have been able to determine what an object is based on the feedback I receive from the device.”

Colleen spends her time with her husband and family, and as a grandmother of 15 and a great-grandmother of three she is kept very busy. Colleen also enjoys knitting, singing in her community choir and reading, getting through an impressive 60 audiobooks per year.

“Testing the device at home and outside has been really interesting and has certainly improved my navigation. I find it the most valuable when I am out and about. It doesn’t replace natural vision but it does enhance my experiences and creates a more engaging environment. I hope to be a part of future developments of the device,” explained Colleen.

CEO of Bionic Vision Technologies, Ash Attia, said.: “This Australian-developed device is more advanced than any in the world. The goal is an affordable cochlear-style implant for millions of people globally who suffer from a genetic condition that robs them of their sight.”

The initial success of the second-generation trial could mean commercial access to the bionic eye is closer than we think, with planning underway for the next phase to further develop the device’s visual processing.

↑ IMAGE CAPTION: ASSOCIATE PROFESSOR PENNY ALLEN WHO LED THE SURGICAL TEAM THAT IMPLANTED AUSTRALIA’S FIRST BIONIC EYE

Gene therapy trial aims to slow the progression of late-stage dry AMD

CERA and The Royal Victorian Eye and Ear Hospital are pioneering another first - hosting two clinical trials involving Australia's first patients to receive gene therapy for late-stage dry age-related macular degeneration (AMD).

There is no treatment for dry AMD which can lead to gradual and permanent loss of central vision.

AMD occurs when debris develop in the central retina, which turns light into vision. Over time, cells in the retina die, leaving gaps in vision. AMD severity is classified as early, intermediate, or late. There are two forms of late-stage disease: 'wet' (for which there are injected treatments) and 'dry,' also known as geographic atrophy, which is characterised by irreversible degeneration of retinal cells.

The investigational gene therapy aims to slow or halt the disease and trials will evaluate safety and effectiveness of treating geographic atrophy, advanced dry AMD.

The therapy is given via a one-off injection into the eye, underneath the retina, using a specialised needle the width of a human hair. The gene combines with a safe, modified virus – known as a viral vector – to help it get into retinal cells.

Vitreoretinal surgeon and CERA's Principal Investigator of Retinal Gene Therapy Research, Dr Tom Edwards, performed the first operations to administer the therapy to two patients in April.

"Gene therapy is an exciting field and ophthalmology is leading the way," he said. "The eye is an attractive target because it is self-contained, we can use smaller doses in a localised area and inject therapy under the retina, into the centre of the eye, where it stays."

"The modified virus targets retinal cells and can be thought of as a delivery van, taking the gene into retinal cells. The viral machinery delivers the genetic payload, which modulates the

immune system in the retina to slow disease progression."

"We're testing if this particular gene can slow or halt the progress of geographic atrophy and there is good laboratory evidence to support this approach."

The therapy increases production of a protein which regulates part of the immune system known as the complement system. Too much activity in the complement system has been strongly associated with AMD development but it is believed that increasing production of the protein could dampen the system's overactivity and reduce inflammation, preserving eyesight.

"The gene remains in the retinal cells and continues expressing the protein. We're still in the early stages, so we don't yet know if it will be a treatment or cure, but we will follow patients for two years," Dr Edwards said.

A UK and USA-based gene therapy company focused on eye diseases, Gyroscope Therapeutics Limited, developed the treatment – GT005. About 20 Australians will be among several hundred patients from America, the UK and Europe also taking part in the trials.

One trial is in patients with a rare gene variation thought to increase chances of treatment success while the other - in patients without the variation – aims to identify sub-groups in whom the therapy may also work.

"Dry AMD is a devastating diagnosis, which robs people of their ability to read, drive or see the faces of loved ones," Dr Edwards said.

"We're testing if this particular gene can slow or halt the progress of geographic atrophy and there is good laboratory evidence to support this approach."

↑ IMAGE CAPTION: VITREORETINAL SURGEON DR TOM EDWARDS PERFORMING THE FIRST OPERATION TO ADMINISTER THE GENE THERAPY. PHOTO CREDIT: MAT LYNN, CERA

Paving the way for AMD research

In the 25 years that ophthalmologist Professor Robyn Guymer has devoted to age-related macular degeneration (AMD) research, she has been instrumental in helping to more than halve the rate of blindness from this devastating disease.

When she began, there was no treatment for age-related macular degeneration and wet late AMD caused severe, irreversible vision loss. As an investigator in international pivotal trials that helped transform the course of this form of AMD, Professor Guymer also pioneered research and novel treatments aiming to reduce progression of early-stage disease to sight-threatening late disease.

"Pivotal treatment trials that patients at the Eye and Ear were part of helped lead the way to what today are miraculous treatments as they more than halved the rate of legal blindness from wet AMD. This was an enormous advance," Professor Guymer said.

She also co-led an Australian trial that investigated new ways to determine disease activity, now adopted internationally, when individualising treatments for wet AMD.

"Pivotal treatment trials that patients at the Eye and Ear were part of helped lead the way to what today are miraculous treatments as they more than halved the rate of legal blindness from wet AMD. This was an enormous advance"

In the early days of these trials, hospital patients had access to wet AMD treatments that were not otherwise available before Therapeutic Goods Administration approval for public use.

"There was no effective treatment for wet AMD so injectable treatment was one of the biggest breakthroughs in ophthalmology," Professor Guymer said.

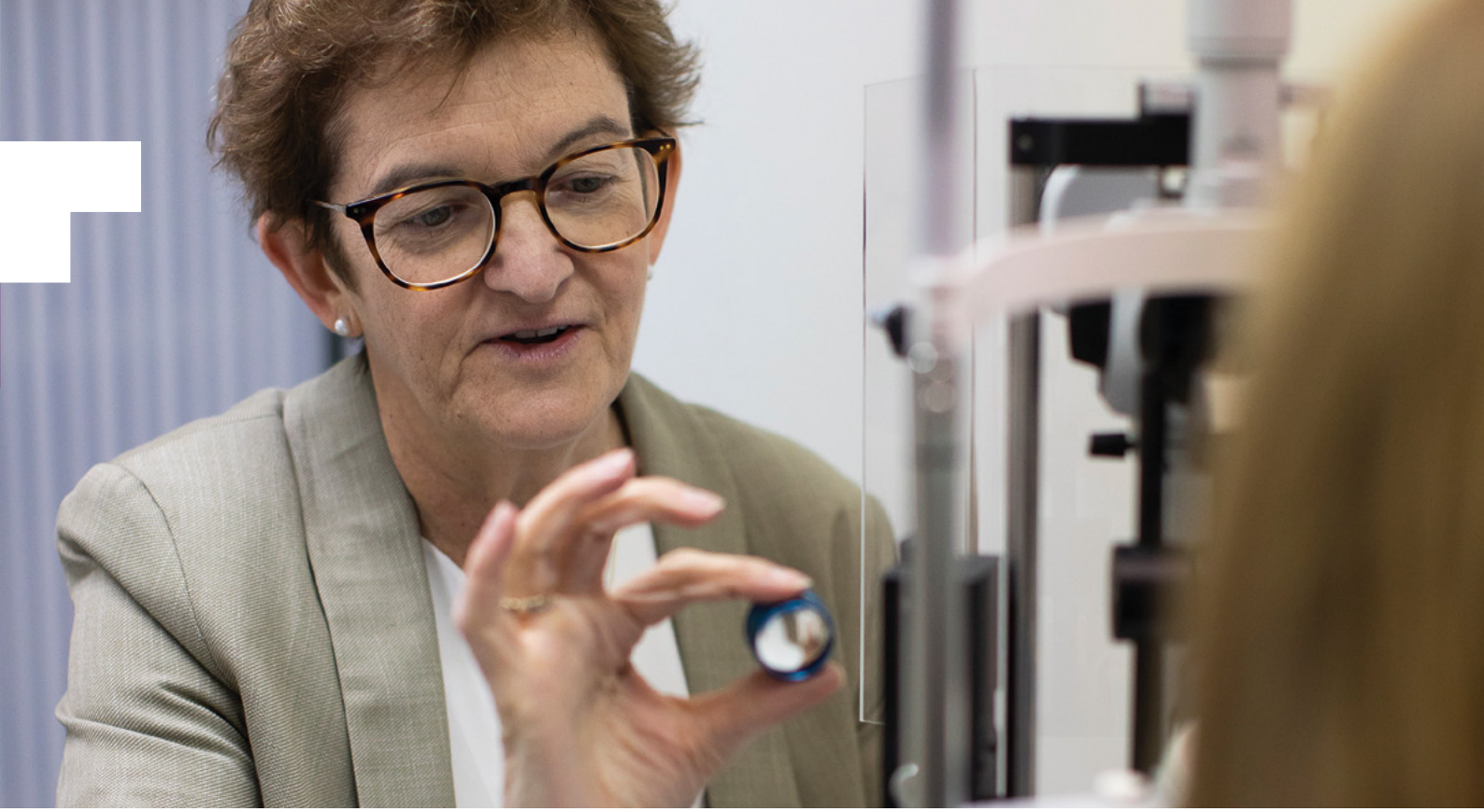
"When I was doing a Fellowship at Moorfields Eye Hospital in London, it was clear that AMD had no treatments and little understanding as to its cause, yet it was the most common cause of legal blindness in people over 50.

"People flew from around the world to attend clinics at Moorfields, only to be told there was nothing that could be done. I realised this was a disease I could research to try to make a difference."

Robyn studied medicine at the University of Melbourne, her PhD at the Walter and Eliza Hall Institute of Medical Research, trained at the Eye and Ear, and undertook a medical retina and ocular plastic fellowship in the UK before returning to the hospital and CERA where she has spent the past 25 years.

Now a world-renowned authority on AMD, she is Deputy Director of CERA where she continues her research, Professor of Surgery (Ophthalmology) at the University of Melbourne and senior retinal specialist at the Eye and Ear, where she has overseen the care of thousands of patients.

Her research started by looking for genetic and modifiable risk factors for AMD, then Professor Guymer's research group at CERA identified features on scans that showed the first signs of retinal cell death (atrophy or dry AMD). This



categorises AMD into levels of risk of vision loss and helps the industry plan intervention trials. Upskilling eye care professionals in identifying these signs is vital for moving to earlier interventions.

She has studied the underlying cause of AMD, the potential for low energy laser treatment to slow progression, refined protocols for giving wet AMD treatments and helped identify patients for gene therapy trials in the dry form of late AMD.

Other achievements include involvement in the MacTel (rare macular disease) Consortium and helping attract a $50 million government grant for development of the Australian bionic eye.

Professor Guymer is consistently ranked in the world's top five AMD experts on Expertscape. Her career highlights include: being awarded Member of the Order of Australia (AM); being an inaugural fellow of the Australian Academy for Health and Medical Sciences; being elected to the International Macular Society and receiving its Richard Green Award for AMD research; receiving the NHMRC's Elizabeth Blackburn Fellowship for the top ranked female Fellow; and, a sabbatical in 2020 as the first Visiting Professor in Ophthalmology to Hoffman La Roche in Basel Switzerland.

> There was no effective treatment for wet AMD so injectable treatment was one of the biggest breakthroughs in ophthalmology"

↑ IMAGE CAPTION: PROFESSOR ROBYN GUYMER WHO HAS BEEN INSTRUMENTAL IN THE PROGRESS OF AGE-RELATED MACULAR DEGENERATION RESEARCH

Smartphones monitoring glaucoma at home

It was the simplicity of it that first struck Dr George Kong: an affordable device that many people already owned that could monitor visual fields for people with the chronic eye condition glaucoma and help avoid vision loss. And it could be done from the safety and convenience of home.

Dr Kong, a glaucoma specialist and general ophthalmologist at the Eye and Ear's Ophthalmology Department, has, with collaborator Professor Algis Vingrys from the University of Melbourne's Ophthalmology and Vision Science Department, developed an app which allows patients with glaucoma to monitor their visual fields on an iPad, reducing the need for patients to travel to a clinic.

"We were initially thinking it could be used as a portable visual field device to improve access to glaucoma care in remote locations because you can take it anywhere quite easily compared to the standard visual field machine that has a very large footprint and is difficult to manoeuvre," Dr Kong said. "Then we realised that there were a lot of patients with iPads at home. We thought 'Let's see whether it's possible for patients to use an iPad and do a visual field test at home."

Development of the software was the start of an exciting breakthrough: it meant that affordable, every-day and easy-to-use technology could be used instead of requiring a patient to travel to a clinic. Dr Kong worked on modelling which showed that if patients could do visual field testing frequently at home it would enable detection of glaucoma progression two years earlier than if the tests had been performed in a clinic.

"With the ageing population there is increasing prevalence of patients with glaucoma who need on-going monitoring," he said. "The health service is constantly struggling to keep up with monitoring patients who may or may not need intervention when they come into the clinic. Using new technology like this would help identify patients who most need intervention. We could spend more clinical resources on patients who are progressing, and possibly conserve some resources on patients who appear to be stable."

Dr Kong published his findings of a pilot home monitoring trial for glaucoma patients in the prestigious *American Journal of Ophthalmology* in March. The study showed the app could test visual field at home comparable to testing using standard machines in a clinic.

Like many innovations, the idea met with initial scepticism. "One of the obstacles we initially had was people's disbelief that you could actually do a visual field test using a commercial-based computer screen," Dr Kong said. "They thought you'd have to have very expensive equipment."

Dr Kong said the convenience and efficiency of testing on an iPad – it takes just three minutes to test each eye - meant much greater testing rates. "Often we don't monitor patients frequently enough," he said. "We sometimes get patients coming into the hospital with vision loss due to glaucoma without them knowing. If we see patients every six months they could get worse in between. In the time of COVID and the problems getting appointments promptly this can become an increasing issue."

The app received funding support from The Royal Victorian Eye and Ear Hospital's Early Career Research Grant, Glaucoma Australia and Perpetual Trust Grant, as well as the Ophthalmic Research Institute of Australia and the Centre for Eye Research Australia's Innovation Fund. It has attracted interest internationally.

“With the ageing population there is increasing prevalence of patients with glaucoma who need on-going monitoring”

↑ IMAGE CAPTION: GLAUCOMA SPECIALIST DR GEORGE KONG WHO DEVELOPED AN APP TO MONITOR GLAUCOMA AT HOME. PHOTO CREDIT: ANNA CARLILE, CERA

Cutting-edge research studying new piezoelectric implantable hearing technology

Experts at the Eye and Ear, led by ENT surgeon Professor Robert Briggs, have collaborated with Cochlear Ltd in an international clinical investigation to examine the safety and effectiveness of a new category of implantable hearing device for treating hearing loss.

More than 1.5 billion people around the world suffer from hearing impairment, with an estimated 430 million experiencing a moderate or higher level of hearing loss in their better ear. Left untreated, hearing loss can negatively impact many aspects of daily life for affected individuals and their families, including communication, speech and language development, educational achievement, employment opportunities, mental health, and social engagement.*

Fortunately, hearing technology is evolving to treat different types of hearing loss and when applied in a timely manner as part of a rehabilitation program, can offer significant benefits to the individual's life. While traditional air conduction hearing aids amplify sounds and transmit them as acoustic sound waves through the ear canal, they are not always effective due to anatomical or medical contraindications. Bone anchored hearing aids (BAHA) are a potential treatment option for people with conductive, mixed, or even sensorineural hearing loss, as they transmit sounds as vibrations through the skull bones directly to the inner ear on the same or opposite side. Previously the vibrating device had to be external to the skin, however with the new transcutaneous active piezoelectric bone conduction system, the transducer is implanted under the skin.

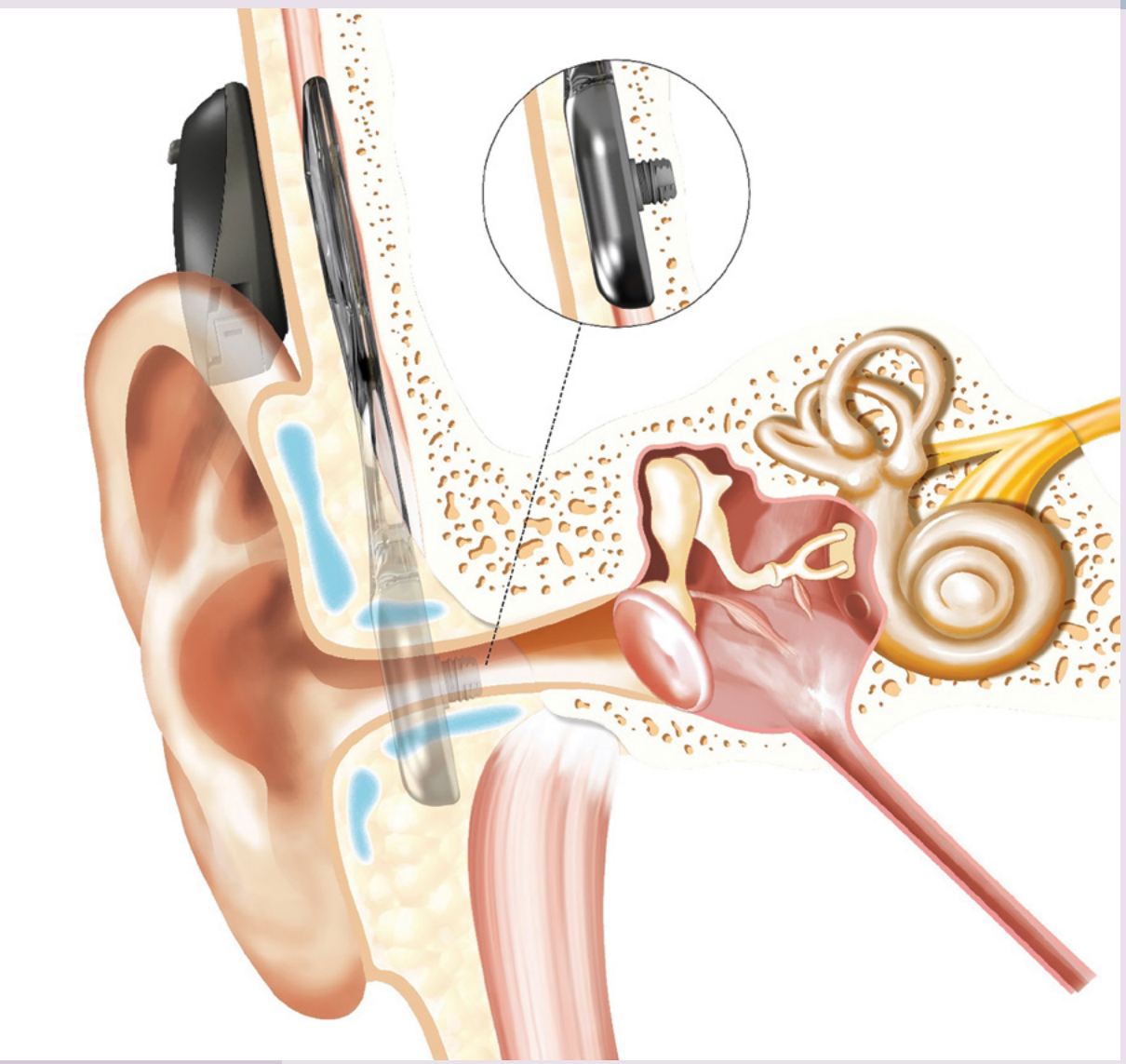
The system is a new category of bone conduction hearing device in which the sound transmitting component uses piezoelectric technology for miniaturisation, improved sound quality, and high frequency amplification. The component that produces the vibrations is fully implanted under the skin, receiving the sound signal transmitted from an externally worn sound processor.

The advantage of this new system is that recipients can get the full hearing benefit of a BAHA without the cosmetic issues and management challenges of a direct connection through the skin.

Professor Briggs and his team were the first to implant patients with the new piezoelectric technology in 2017, as part of two international, multi-centre studies involving 80 adults collectively across clinics in Australia, Germany, the Netherlands, Poland, Hong Kong, and the United States. Preliminary findings indicate that on average, the patient groups demonstrated significant improvements in hearing thresholds, health-related quality of life, and understanding of speech in both quiet and noisy listening environments.

The team at the Eye and Ear has been pleased to lead these multi-centre studies and to provide the new implants for our patients. The outcomes have been very successful, with excellent patient satisfaction and hearing benefit. We now look forward to the system being approved by the Therapeutic Goods Administration for use in Australia.

* The device featured in the clinical investigation is currently not approved in Australia



↑ IMAGE CAPTION: DIAGRAM OF THE INNER AND OUTER EAR DISPLAYING THE NEW PIEZOELECTRIC HEARING IMPLANT

Thyroid eye disease database determines genetic and environmental risk factors

About 75,000 Australians have Thyroid eye disease – or TED - and ophthalmologist Dr Jwu Jin Khong is on a mission to research causes and help find better treatments for these patients.

Medications and surgery to reduce symptoms are limited in reducing severity for many patients so Dr Khong has compiled a database of patients aiming to pinpoint genes, prevent TED from developing and create new treatments to retain vision.

In Australia about 4,000 people have moderate to severe TED requiring treatment. In some, loss of vision or reduced vision occurs due to optic nerves being compressed by eye muscles swelling. The cornea can also become dry and exposed, causing corneal ulcers or infection.

A consultant ophthalmologist in the Orbital, Plastics and Lacrimal Unit at the Eye and Ear, Dr Khong is also Research Fellow and Principal Investigator for Thyroid Eye Disease Research at CERA.

"TED is related to an overactive thyroid, caused by a reactive immune system that attacks its own thyroid gland. It affects mainly females in their 40s but can affect males and people of other ages," she said. "It causes bulging eyes, double vision, sensitivity to light, watering, redness and eyelid swelling during the active phase when symptoms escalate."

Dr Khong said one in 1,000 people have Graves' fisease, or overactive thyroid, and one-quarter of them develop TED. Most with TED have Graves' but 10 per cent have underactive thyroid (Hashimoto's disease) or normal thyroid function.

Medication initially reduces swelling and inflammation around the eyes but may not diminish all symptoms. Patients are often left with long term vision disability or persistent double vision from eye muscle scarring and may need multiple surgeries for eye protrusion, eyelid retraction resulting in staring and double vision.

About eight genes are known to predispose to Graves' disease but it is unclear if TED is genetically linked.

In 2014 Dr Khong started the Australian Thyroid Eye Disease database, which now includes blood samples of more than 1,000 people with Graves' disease, some with and others without TED. It is used for studies to determine genetic and environmental risk factors that predispose those with Graves' to TED, and to study the extent of gene and environmental risk factor interaction to determine why some with Graves' develop TED and others do not.

"This TED database - one of the world's largest – is a rich resource for future eye research as our understanding for thyroid eye disease progresses perhaps with international collaborations"

The database stores over 200 fat tissue samples from around the eyes of TED patients and other eye surgery patients to compare gene expression.

"We found smoking doubles the risk for Graves' patients to develop TED, being older is a risk factor as is having Graves' disease for longer duration. Selenium level in TED patients was also marginally lower than in people without TED," Dr Khong said.

The research identified a gene potentially associated with TED, multiple genes associated with the inflammatory response and several new genes over-expressed in TED-affected soft tissues in the active phase, indicating the body's immune response is over-firing during acute attacks.

"This TED database - one of the world's largest – is a rich resource for future eye research as our understanding for thyroid eye disease progresses perhaps with international collaborations," Dr Khong said. "More work is needed to validate gene expression, and we hope this will enable discovery of new immune modulators to target inflammation and halt disease progression."

Dr Khong has also completed a review comparing therapies and has developed practice guidelines.

"More work is needed to validate gene expression, and we hope this will enable discovery of new immune modulators to target inflammation and halt disease progression."

↑ IMAGE CAPTION: THYROID EYE DISEASE RESEARCH AND OPHTHALMOLOGIST DR JWU JIN KHONG

3D Printed Anatomical Orbital Model for Anaesthesia and Ophthalmology Trainees

More than half of Australia's population over the age of 65 have a cataract in need of repair, equalling more than 70,000 procedures in Australia alone each year. At the Eye and Ear, a junior doctor will learn the process of injecting local anaesthetic via a sharp needle next to eye globe to keep it still and pain free. While usually very safe, complications such as seizures, or blindness may occur in rare cases.

In the last three years, at our hospital alone, six patients have suffered real blindness. Doctors are still reliant on rare and expensive cadavers, ad hoc access to experts, simplistic models, and practice with real patients. There just isn't enough exposure to rare cases in the training hours available. As part of the continuous improvement at the Eye and Ear, we are enhancing training for doctors, and trainee anesthetists in response to feedback reflecting that 80% of this cohort want access to specialised training.

Practice makes perfect, and simulation of procedural techniques has been proven to increase patient safety and reduces time taken to achieve basic proficiency by more than 50%.

We have created a combined training model with the look, touch and feel needed for successful practice, in three parts:

1. Access to expert knowledge with online e-learning
2. Real-world practice via virtual immersive training and life-like anatomical 3D printed simulators or models that provide live feedback for hands-on practice of the procedure (replacing traditional, cadaver tutorials)
3. Expert guided workshops for trainees, hosted at the Eye and Ear. Doctors gain expert training, and confidence, patients experience reduced complications and higher satisfaction, and hospitals improve clinical efficiency, and reduce risk and cost.

The team has partnerships with world renowned Emeritus professors, anatomists, engineers, clinicians and industry experts from Melbourne, Monash and RMIT Universities and the Eye and Ear. This project has been successful in attracting up to $185,000 in grants in the last two years.

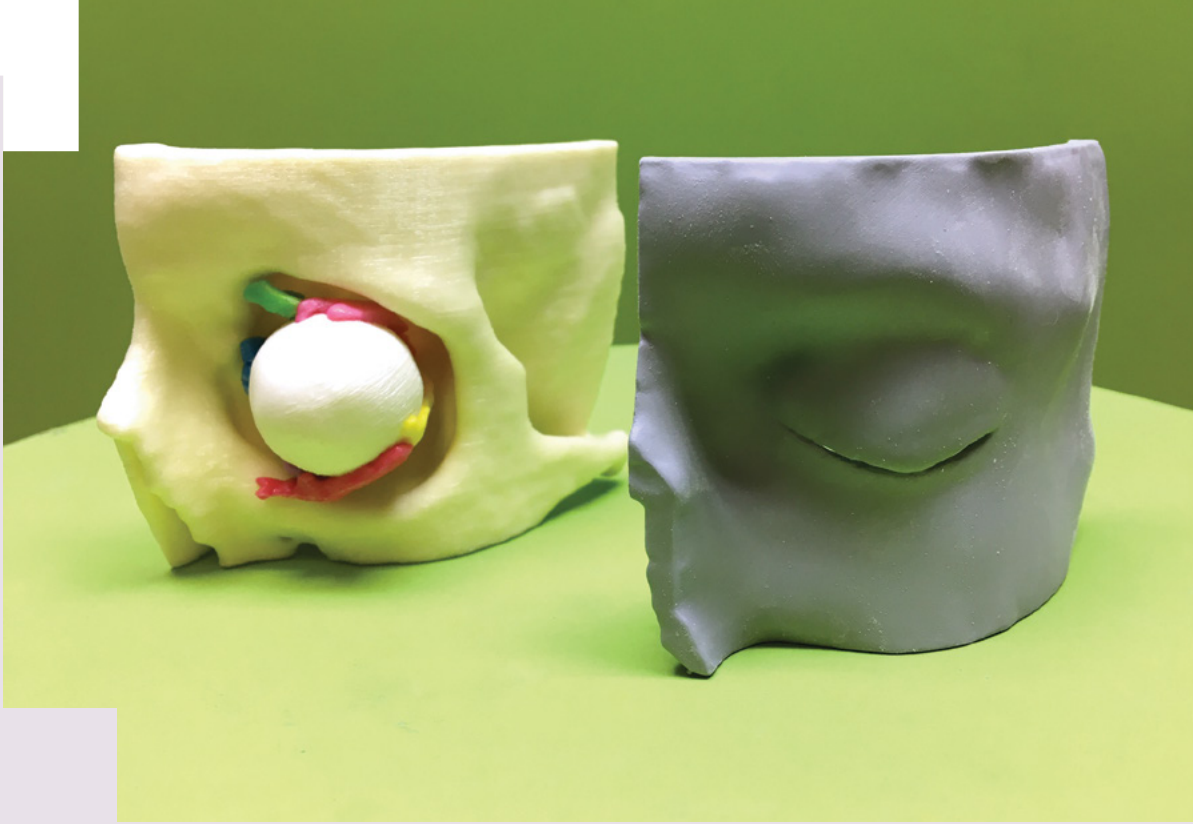
How it works

This model will put the 'flesh' onto existing 3D printed hard models to bridge the gap in medical education for procedures on soft tissues.

The team has created a disposable orbital cartridge and head for practice, with live feedback and the access to rare anatomical differences that you can't access in the real clinical world. MRI scans are converted to digital files where the specific anatomy is highlighted and coded. This is then converted to files for printing. Materials to replicate the soft and delicate tissues such as skin of eyelids, orbital muscles and the fat between are being created for the first time to replicate real life and in a single anatomically accurate print. `It is printed at RMIT with a rare high-tech 3D Stratasys 750 printer, of which there are only three in Australia.

The revolutionary feature of this model is a series of bespoke 3D models of real anatomical pathology with silicone polymers mimicking soft tissue planes and real-time warning, improving patient safety.

We are on track for prototype and e-learning testing, a validation trial and are trialling the first prototype in the coming months. We anticipate multiple models being achieved and that this program will enable much improved patient safety, increased hospital efficiency, and revolutionise medical training.



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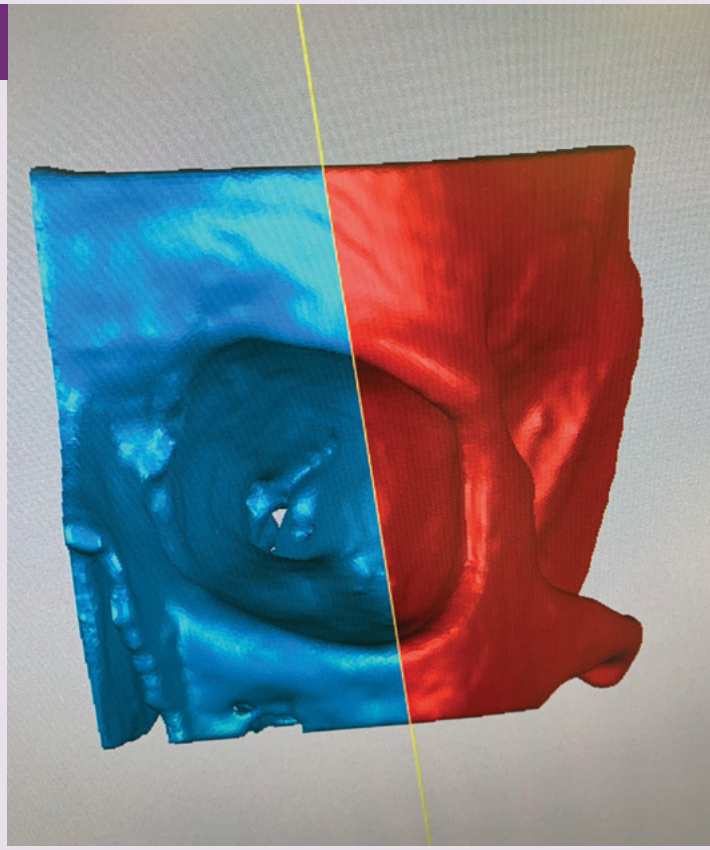
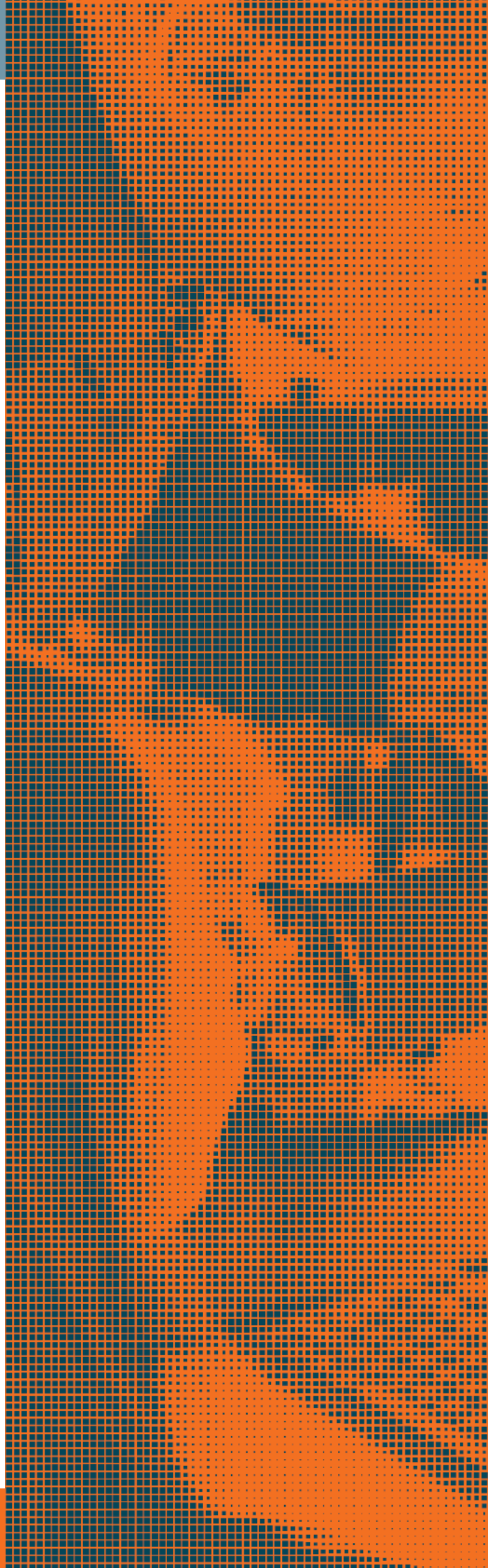


↑ IMAGE CAPTION: A SELECTION OF 3D PRINTED ANATOMICAL ORBITAL MODELS FOR ANAESTHESIA AND OPHTHALMOLOGY TRAINEES

We are known and renowned locally, nationally and internationally for the work we do.



Sharing our knowledge

On the global stage

In 2020–21 many of our expert staff were invited to present at the World Association of Eye Hospitals (WAEH) monthly webinars and annual conference. All member-hospitals are “centres of excellence” in ophthalmology, focused on delivering the best and safest ophthalmic care. Our staff from a range of disciplines shared their experience presenting on the global stage.

↑ IMAGE CAPTION: EYE AND EAR PERIOPERATIVE NURSES

Catherine Mancuso, Acting Manager Planning and Patient Experience

Effective, efficient and safe: Alternate post-operative models
As part of the Specialist Clinics Access Improvement Partnership initiative, we identified an improvement opportunity in our Surgical Post–Operative Clinic, and in 2020 piloted our Orthoptic Surgical Ophthalmology Postop (OSOP) Clinic. Catherine's presentation highlighted the benefits of the OSOP clinic which utilises our orthoptic staff instead of medical staff, to provide post-operative care for our patients who have had uncomplicated cataract surgery.

"Medical staff are a highly skilled and limited resource, so it is important that they are available to assess and treat our most vulnerable patients," she said. "By using other skilled clinical staff (either allied health or nursing staff) to provide care for patients who do not need intervention by medical staff, we are creating more capacity for our medical staff to be practising their skills where they will make the biggest impact."

Tracy Siggins, Acting Executive Director Operations

Improvement in action – COVID-19 response
As the healthcare industry globally commenced COVID-19 response activity, we adopted and embedded an evidence-based approach to guide how improvement capability is built across the hospital. The improvement model was used to inform, implement and evaluate our various COVID responses within the specialist clinics setting.

"The worldwide audience was very interested in Australia's COVID experience and how the impact had differed across the country," Tracy explained.

"This opportunity provided a platform on which to showcase a unique approach to managing the tension existing between COVID restriction requirements, patient clinical care needs and staff safety concerns of themselves, their colleagues and their patients. I hope the presentation provided suggestions and ideas to health services attending around the world including how they could approach periods of significant pandemic restrictions."

Loretta Sheales, Executive Director — People and Communications

Employee health and happiness: today's COVID-19 ways of working
The landscape in Victoria and across the globe in 2020 was unprecedented, and as Melbourne went into stage four COVID-19 restrictions, our work and family lives plunged into unchartered territory. The importance of maintaining employee health and wellbeing had never been so critical.

"We acknowledged that our patients received better quality care if staff felt safe, were encouraged to raise concerns and were well supported to thrive," Loretta said. "The capability and effectiveness of leaders was critical to the provision of a safe workplace that fostered health and wellbeing."

An Ly, Service Improvement Coordinator

Different models of eye care – from satellites to community outreach
Aboriginal and Torres Strait Islander people in Australia are three times more likely to suffer vision impairment compared to non-Aboriginal people. Approximately 90 percent of vision impairment and blindness in the Aboriginal population is preventable or treatable.

To support Aboriginal eye health, we established a partnership with the Victorian Aboriginal Health Services to launch an Ophthalmology Outreach Clinic. The main aim of the clinic is to provide improved access to eye health care in the Aboriginal community.

"Shining a light on our work in improving access to eye healthcare for the Aboriginal and Torres Strait Islander community helps to drive and improve the service where possible," An said. "Promoting not just cultural awareness, but general awareness of the services available allows us to promote a tailored service within an environment that is culturally safe and trusted."

Renee Chmielewski, Acting Quality Manager

Patient storytelling at meetings
Storytelling is an important aspect of everyday life. In a clinical setting, it assists staff in better understanding the patient perspective. By including patient stories regularly in meetings, we enable meaningful discussion among staff, while ensuring the patient voice is at the forefront of the conversation.

"The focus of my presentation was on the power of using patient stories to drive positive improvement and culture change," Renee said. "I really enjoyed the experience of presenting at the international level. I found the audience was interested in the content of my presentation and the questions asked showed the difference between countries in relation to improving the patient experience."

Virtual reality training helps eye surgeons return with confidence

Imagine there was a way to improve ophthalmic microsurgical skills, mind techniques and surgeon confidence without any risk? This is what Dr Jacqueline Beltz, Director of Training, set out to achieve with the launch of GENEYE in 2019— a new way of providing surgical education for the next generation of eye surgeons.

The inaugural GENEYE Ophthalmic Microsurgical Skills Conference invited medical students, junior doctors, advanced ophthalmic trainees and consultants to engage in a one day immersive and holistic learning program.

GENEYE focuses on the development of technical and mind skills such as forward planning, self-direction, situation awareness and judgement - all skills required to be an excellent surgeon.

The conference was a success, and planning had commenced for its return in 2020, when COVID-19 hit and halted its progress along with elective surgery across Australia.

Rapid response to service the need

With surgeons out of theatres indefinitely due to the pandemic, and as the halt on elective surgeries extended, the need for return to surgery training became evident. It was quickly determined that this break could have detrimental effects on a surgeon's confidence and ability and ultimately impact patient safety.

Now, more than ever, this training was required to prepare surgeons for when theatres reopened, allowing them to return with confidence. The uncertainty of the COVID-19 landscape meant we had to work quickly.

Leading the return to surgery program was the Eye and Ear's Dr Jacqueline Beltz and consultant ophthalmologist Dr Rahul Chakrabarti. In March 2020, the peak of the pandemic, Dr Beltz, Dr Chakrabarti and Dr Bernardo Soares worked tirelessly to launch an online training program, video resources, an on-site virtual reality (VR) program and a podcast in a matter of weeks. Joining their efforts was Dr Rachel Chang and Dr Mohamed El Nahrawy.

At the core is patient safety. The training supports continual improvement of the skills of surgeons by focusing on a wide range of competencies.

"Returning to surgery after a break is always difficult, but we could see this difficulty escalating post-COVID," Dr Beltz explained.

"For some surgeons this enforced break may have had little impact, but for others, especially trainees and junior surgeons, we predicted that there may be noticeable reduction in the technical or mind skills that are required to perform surgery to a safe and high standard."

Benefits outweigh the complications

The difference between the GENEYE program and other virtual reality training is its completely integrated nature. The program takes a holistic approach by understanding that it takes more than technical skills to be an excellent surgeon. A 2018 study conducted by Dr John Ferris found a 38 percent reduction in cataract surgery complications for trainees utilising virtual reality technology during their training.

Through our virtual reality simulators powered by Eyesi, our surgeons can practise complicated surgery and try new surgical techniques with zero risks.

"Evidence is now very clear that access to virtual reality simulators reduces complications in ophthalmology. We believe that incorporating VR training into our structured training program allows our trainees to practise in a safe, ethical, repeatable and low-pressure environment,

while increasing their skills to the level required for live surgical practice," Dr Beltz said.

In June 2019, Dr Chakrabarti travelled to London for the World Association of Eye Hospitals conference, and presented the local data of our surgical simulation work, including the success of the GenEye program in a global forum.

"It was really rewarding to showcase the work of GENEYE and build a community of practice with other major eye hospitals around the world," Dr Chakrabarti explained.

What's next for GENEYE?

The program is set to become compulsory as part of the Royal Australian and New Zealand College of Ophthalmologists (RANZCO) education and training policies, meaning the training will become a requirement for all trainee surgeons returning from an extended time away.

"Now, the structured program can be accessed at any time for surgeons who have been on a sabbatical or maternity leave, for example. We receive requests for the training every few weeks from trainees and consultants of all levels," Dr Chakrabarti said.

"If we can encourage high performance from the beginning and train our future surgeons in all these aspects of high performance, then their innovations will astound us. Patients will benefit and hopefully these young surgeons will have more satisfying and enriching careers."

While GENEYE events will continue to be virtual this year, we are looking forward to delivering a face-to-face program in 2022 to coincide with the opening of the Eye and Ear's new Education Precinct, which will include a microsurgery laboratory and Virtual Reality Centre.

"If we can encourage high performance from the beginning and train our future surgeons in all these aspects of high performance, then their innovations will astound us. Patients will benefit and hopefully these young surgeons will have more satisfying and enriching careers."

↑ IMAGE CAPTION: THE EYE AND EAR GENEYE TEAM

Supporting Victoria: Victorian Cochlear Implant Program

In Victoria, less than 10 percent of people who can benefit from a cochlear implant access one. As part of our commitment to creating better specialist care access for patients across Victoria, and to support the expansion of our cochlear implant services, the Victorian Cochlear Implant Program (VCIP) was launched in 2021.

The program establishes local cochlear implant audiology services via a collaboration between The Royal Victorian Eye and Ear Hospital, Cochlear Ltd and community hearing service providers across Victoria, creating a state-wide cochlear implant service.

Ballarat Hearing Clinic became one of the first members of the training and support program. The alliance helped upskill its team to better identify suitable cochlear implant candidates locally and refer accordingly.

As well as the Ballarat community, areas including Ararat, Stawell, St Arnaud and Donald will also be serviced by Ballarat Hearing Clinic resulting in better access to cochlear implant services. The initiative also means continuity of care for cochlear patients in these locations is more achievable.

Audiologists Talia Pumpa and Kurt Ashworth will provide cochlear implant services for Ballarat Hearing. Kurt has worked at the clinic for 12 years and speaks highly of his experiences with the program and its benefits for the clinic and patients.

"The whole experience has been very collaborative. I've really enjoyed the training and I can see the long-term benefits for audiologists and patients," he said.

The program provides audiologists with training to better identify patients who can benefit

most from a cochlear implant. A blended model including face-to-face and virtual training is rolled out over six months.

Robert was one of the first Ballarat patients to be successfully referred for a cochlear implant as part of the VCIP. At 89, it has become increasingly difficult for him to keep up in conversations with friends and family.

A common struggle among older Australians with hearing loss is withdrawing from family and social activities. The program advocates that it is never too late to take control of your hearing and improve your quality of life, which is why more older Australians are now choosing a cochlear implant.

"If it works out for him, it will vastly improve his quality of life. One of his goals is to understand his family better and be more involved in their conversations," Kurt explained.

Robert said: "I was surprised that I was eligible for a cochlear implant, as I didn't think I would be at my age. After Kurt did the tests and explained the process I was delighted and happy to take his advice as I trust him. He never pressured me into making a decision either way, he just gave me all the information and explained everything in a way that was easy to understand." Travelling from regional Victoria to the CBD for appointments can be time consuming, and potentially daunting for some patients. During the first year of the cochlear implant process, instead of committing to about 12 visits to Melbourne for appointments at the Eye and Ear, VCIP patients are only required to travel to Melbourne for an ENT assessment and the surgery (if they choose to proceed) with the rest conducted locally with their audiologist.

"The process has been a breeze; all my appointments have been booked in for me and everyone has been so kind and patient with me. I couldn't be happier," Robert said.

Mr Ashworth added: "Being able to say to them, they can have surgery in Melbourne then come back and see me for the rest of the process has been a really appealing factor in a patient's decision-making. In some cases, we've had a ten-year relationship and built great trust during this time so to be able to provide them with local care after their surgery is really rewarding."

Robert said: "The thing I am looking forward to most when I have my cochlear implant switched on is just general conversations with friends and family. And watching the tellie with my family; they don't like watching with me at the moment because I have to turn it up too loud."

As part of the program, cochlear implant candidacy decision-making, postoperative management and long-term care of cochlear implant recipients will be undertaken by the local audiology service provider. Medical management, surgical decision-making and surgical services will remain centralised at the Eye and Ear.

Robert's surgery was successful, and he is looking forward to being able to continue his association with his local audiologist for his cochlear implant check-ups and maintenance.

"The whole experience has been very collaborative. I've really enjoyed the training and I can see the long-term benefits for audiologists and patients"

↖ IMAGE CAPTION: THE BALLARAT HEARING CLINIC TEAM

Senior Medical Staff list

Directors

Assoc Prof. Carmel Crock, OAM, Director Emergency Department
Dr Sean Jespersen, Executive Director, Medical Services, Chief Medical Officer
Dr David Marty, Clinical Director, ENT Services
Dr Mark McCombe, Clinical Director, Ophthalmology Services
Dr David Ware, Director, Anaesthesia
Assoc Prof. Rachel Conyers, Director Medical Services

Heads of Clinic

Assoc Prof. Penelope Allen, Head Vitreoretinal Unit
Dr Vasuki Anpalahan, Chair, Senior Medical Staff ENT Section
Dr Jacqueline Beltz, Director Clinical Training
Professor Robert Briggs, Head, Cochlear Implant and Chair, Senior Medical Staff
Assoc Prof. Anne Brooks, AM, Clinical Lead, Acute Ophthalmology Services and Head, Specialist Eye Clinic 3
Assoc Prof. Susan Carden, Head, Education Vision Assessment Clinic
Dr Anne Cass, Head, Head and Neck
Prof. Mark Daniell, Head, Cornea
Dr Tricia Drew, Chair, Senior Medical Staff Eye Section
Assoc Prof. Jean-Marc Gerard, Head, Otology
Dr Catherine Green, AO, Head, Glaucoma
Dr Thomas Hardy, Head, Orbital Plastic and Lacrimal Clinic
Dr Alex Harper, Head, Medical Retina
Dr Lionel Kowal, Head, Ocular Mobility Clinic
Assoc Prof. Lyndell Lim, Head, Ocular Immunology
Dr John Manolopoulos, Clinical Lead, Surgical Opthalmology Service
Dr John McKenzie, Head, Ocular Oncology
Dr Halil Ozdemir, Director of Training, Otolaryngology
Dr Elizabeth Rose, Head, Paediatric ENT
Dr Marc Sarossy, Head, Ocular Diagnostics
Dr Neil Shuey, Head, Neuro Ophthalmology
Dr David Szmulewicz, Head, Balance Disorders and Ataxia Service
Dr Christine Tangas, Clinical Lead, Surgical Opthalmology Service
Dr Robyn Troutbeck, Clinical Lead, Acute Ophthalmology Service
Dr Anton Van Heerden, Head, Surgical Ophthalmology Service
Dr Kristen Wells, Clinical Lead, Acute Ophthalmology Service
Dr Yi Chen Zhao, Head, Rhinology Clinic

Ophthalmologists

Dr Robin Abell, Ophthalmologist
Dr Suheb Ahmed, Ophthalmologist
Dr Alex Amini, Ophthalmologist
Dr Brian Ang, Ophthalmologist
Dr Alicia Au, Ophthalmologist
Dr Renuka Bathija, Ophthalmologist
Dr Benjamin Burt, Ophthalmologist
Dr William Campbell, Ophthalmologist
Dr Dermot Cassidy, Ophthalmologist
Dr Elsie Chan, Ophthalmologist
Dr Helen Chan, Ophthalmologist
Dr Ye Chen, Ophthalmologist
Dr Timothy Cheong, Ophthalmologist
Dr Daniel Chiu, Ophthalmologist
Dr Au Ch'Ng, Ophthalmologist
Assoc Prof. Elaine Chong, Ophthalmologist
Dr Li Chow, Ophthalmologist
Dr Ben Clark, Ophthalmologist
Dr Georgia Cleary, Ophthalmologist
Dr Amy Cohn, Ophthalmologist
Dr Benjamin Connell, Ophthalmologist
Assoc Prof. Michael Coote, Ophthalmologist
Dr Joan Cosgrove, Ophthalmologist
Dr Katarina Creese, Ophthalmologist
Dr Rodger Davies, Ophthalmologist
Dr Rosie Dawkins, Ophthalmologist
Dr Fio De Vincentis, Ophthalmologist
Dr Lana Del Porto, Ophthalmologist
Dr Thomas Edwards, Ophthalmologist
Assoc Prof. Rohan Essex, Ophthalmologist
Dr David Fabinyi, Ophthalmologist
Dr Xavier Fagan, Ophthalmologist
Dr Jennifer Fan Gaskin, Ophthalmologist
Dr Lisa Farber, Ophthalmologist
Dr David Francis, Ophthalmologist
Dr Justin Friebel, Ophthalmologist
Dr Brent Gaskin, Ophthalmologist
Dr Trevor Gin, Ophthalmologist
Dr Padmini Gnanaharan, Ophthalmologist
Dr Nishant Gupta, Ophthalmologist
Professor Robyn Guymer, AM, Ophthalmologist
Dr Thomas Hardy, Ophthalmologist
Dr Oded Hauptman, Ophthalmologist
Dr Rebecca Haward, Ophthalmologist
Dr Alex Hewitt, Ophthalmologist
Dr Michael Jamieson, Ophthalmologist
Dr Jonathan Kam, Ophthalmologist
Dr Nathan Kerr, Ophthalmologist
Dr Jwu Jin Khong, Ophthalmologist

Dr George Kong, Ophthalmologist
Dr Gary Leber, Ophthalmologist
Dr Shueh Lim, Ophthalmologist
Dr Troy Lim Joon, Ophthalmologist
Dr Ming-Lee Lin, Ophthalmologist
Dr Cecilia Ling, Ophthalmologist
Dr Lance Liu, Ophthalmologist
Dr Lei Liu, Ophthalmologist
Dr Ross MacIntyre, Ophthalmologist
Dr Nicholas Mantzioros, Ophthalmologist
Dr Wendy Marshman, Ophthalmologist
Professor Keith Martin, Ophthalmologist
Dr Bryan Matthews, Ophthalmologist
Dr Daniel McKay, Ophthalmologist
Assoc Prof. Alan McNab, Ophthalmologist
Dr Jonathan Moodie, Ophthalmologist
Dr Ching Hui Ng, Ophthalmologist
Dr Thanh Tan Nguyen, Ophthalmologist
Dr Szczepan Nowakowski, Ophthalmologist
Dr Dai Ni Ong, Ophthalmologist
Dr Terrence Ong, Ophthalmologist
Dr Nima Pakrou, Ophthalmologist
Dr Pathmanathan Pathmaraj, Ophthalmologist
Dr Zelda Pick, Ophthalmologist
Dr Dustin Pomerleau, Ophthalmologist
Dr Alexander Poon, Ophthalmologist
Assoc Prof. Salmaan Qureshi, Ophthalmologist
Dr Edward Roufail, Ophthalmologist
Dr Jonathan Ruddle, Ophthalmologist
Dr Joseph San Laureano, Ophthalmologist
Dr Sukhpal Sandhu, Ophthalmologist
Dr Sivakhami Satchithananthan, Ophthalmologist
Dr Hakki Semerli, Ophthalmologist
Dr Andrew Shaw, Ophthalmologist
Dr Justin Sherwin, Ophthalmologist
Dr Shivanand Sheth, Ophthalmologist
Dr Simon Skalicky, Ophthalmologist
Dr Richard Stawell, AM, Ophthalmologist
Dr Mark Steiner, Ophthalmologist
Dr Charles Su, Ophthalmologist
Dr Laurence Sullivan, Ophthalmologist
Dr Jennifer Tan, Ophthalmologist
Dr Mei Tan, Ophthalmologist
Dr Tu Tran, Ophthalmologist
Professor Rasik Vajpayee, Ophthalmologist
Dr Faye Walker, Ophthalmologist
Dr Mark Walland, Ophthalmologist
Dr Harry Wenas, Ophthalmologist
Dr Mark Whiting, Ophthalmologist
Assoc Prof. Sanjeewa Wickremasinghe, Ophthalmologist
Dr Elaine Wong, Ophthalmologist
Dr Heathcote Wright, Ophthalmologist
Dr Jonathan Yeoh, Ophthalmologist
Dr Aaron Yeung, Ophthalmologist
Professor Ehud Zamir, Ophthalmologist
Dr Wenwen Zhang, Ophthalmologist

Otolaryngologists

Dr Vasuki Anpalahan, Otolaryngologist
Dr Simon Braham, Otolaryngologist
Professor Robert Briggs, Otolaryngologist
Dr Christopher Brown, Otolaryngologist
Dr Anne Cass, Otolaryngologist
Dr June Choo, Otolaryngologist
Dr Markus Dahm, Otolaryngologist
Dr Nadine de Alvis, Otolaryngologist
Dr Simon Ellul, Otolaryngologist
Assoc Prof. Jean-Marc Gerrard, Otolaryngologist
Dr Mark Guirguis, Otolaryngologist
Dr Fiona Hill, Otolaryngologist
Dr Guillermo Hurtado, Otolaryngologist
Dr Claire Iseli, Otolaryngologist
Dr David James, Otolaryngologist
Dr Richard Kennedy, Otolaryngologist
Dr Randal Leung, Otolaryngologist
Dr Halina Mann, Otolaryngologist
Dr David Marty, Otolaryngologist
Dr Andrew Timothy McLean, Otolaryngologist
Dr Philip Michael, Otolaryngologist
Dr Justin O'Brien, Otolaryngologist
Professor Stephen O'Leary, Otolaryngologist
Dr Halil Ozdemir, Otolaryngologist
Dr Truong An Thuy Pham, Otolaryngologist
Dr Timothy Price, Otolaryngologist
Dr Elizabeth Rose, Otolaryngologist
Dr Theo Sdralis, Otolaryngologist
Dr Michael Tykocinski, Otolaryngologist
Dr Robert Webb, Otolaryngologist
Dr Benjamin Wei, Otolaryngologist
Dr Yi Chen Zhao, Otolaryngologist

Anaesthetists

Dr Matthew Acheson, Anaesthetist
Dr Ju Pin Ang, Anaesthetist
Dr Jacob Boon, Anaesthetist
Dr Andrew Braun, Anaesthetist
Dr Linda Cass, Anaesthetist
Dr Jun Keat Chan, Anaesthetist
Dr Stephen Charles Chester, Anaesthetist
Dr Melinda Chouman, Anaesthetist
Dr Elizabeth Coates, Anaesthetist
Dr Suzanne Cook, Anaesthetist
Dr Iresha Dissanayake, Anaesthetist
Dr Sarah Donovan, Anaesthetist
Dr Gavin Doolan, Anaesthetist
Dr Duncan Forbes, Anaesthetist
Dr Natalie Gattuso, Anaesthetist
Dr Alexander Gershenzon, Anaesthetist
Dr Grace Gunasegaram, Anaesthetist
Dr Melissa Haque, Anaesthetist
Dr Gaylene Heard, Anaesthetist
Dr Sean Hearn, Anaesthetist
Dr William Hurley, Anaesthetist
Dr Zoe Keon-Cohen, Anaesthetist
Dr Jennifer King, Anaesthetist
Dr Sarah Kondogiannis, Anaesthetist
Dr Shu Ying Lai, Anaesthetist
Dr Daniel Lane, Anaesthetist
Dr Joshua Lau, Anaesthetist
Dr Ei Leen Lee, Anaesthetist
Dr Yasmin Lennie, Anaesthetist
Dr Ana Licina, Anaesthetist
Dr Lisa Lin, Anaesthetist
Dr John Lioufas, Anaesthetist
Dr Vaishali Londhe, Anaesthetist
Dr Sarah Madden, Anaesthetist
Dr Robyn Maina, Anaesthetist
Dr Kameel Marcus, Anaesthetist
Dr Christopher Moran, Anaesthetist
Dr Al Motavalli, Anaesthetist
Dr Victoria Moulson, Anaesthetist
Dr Bishoy Moussa, Anaesthetist
Dr Shailesh Murty, Anaesthetist
Dr Lisa Nasis, Anaesthetist
Dr Michelle Natividad, Anaesthetist
Dr Igor Oleinikov, Anaesthetist
Dr Annie Poon, Anaesthetist
Dr Junia Rahman, Anaesthetist
Dr Dayalan Ramasamy, Anaesthetist
Dr John Riseborough, Anaesthetist
Dr Mhousci Scanlan, Anaesthetist
Dr Gloria Seah, Anaesthetist
Dr Peter Seal, Anaesthetist
Dr Sharanjeet Sidhu, Anaesthetist
Dr David Tan, Anaesthetist
Dr Dennis Teh, Anaesthetist
Dr Li Ann Teng, Anaesthetist
Dr Andrew Tymms, Anaesthetist
Dr Gordana Ukalovic, Anaesthetist
Dr Andrew Walpole, Anaesthetist
Dr Crispin Wan, Anaesthetist
Dr Derrick Wong, Anaesthetist
Dr Andrew Wyss, Anaesthetist
Dr Zi Yang, Anaesthetist
Dr Kah Yep, Anaesthetist

Physicians

Dr Julian Bosco, Physician
Dr Anthony Fok, Neurologist
Dr Timothy Godfrey Clinical, Immunologist
Dr Gayatri Jain, Physicians
Dr Caroline Jung, Endocrinologist
Dr Michelle Papandony, Physician
Dr Laura Ross, Physician
Dr Lauren Sanders, Neurologist
Dr Michael Tan, Physicians
Dr Anneke Van der Walt, Neurologist
Dr Christine Wools, Neurologist

Emergency, Physician

Dr Stephen Parnis, Consultant ED

GP Liaison

Dr Lina Nido, General Practice Liaison Officer

Emeritus Consultants

Dist Professor Graeme Clark, AC, Emeritus Consultant
Dr Kevin Kane, Emeritus Consultant
Assoc Prof. Justin O'Day, AM, Emeritus Consultant
Dr Brian Pyman, Emeritus Consultant
Professor Hugh Taylor, AC, Emeritus Consultant
Dr John Thomson, Emeritus Consultant

Our community

The winners of 2020–21

The Royal Victorian Eye and Ear attracts the best and the brightest eye, ear, nose and throat specialists from around Australia and the world. This year, our staff have demonstrated outstanding leadership in difficult circumstances.

In January 2021, three of our expert clinicians were nationally acknowledged in the 2021 Australia Day honours; Director of the Emergency Department, Associate Professor Carmel Crock, ophthalmologist and Head of Special Eye Clinic 3, Associate Professor Anne Brooks, and former Chief of Medical Staff and ophthalmologist, Dr Richard Stawell.

Associate Professor Carmel Crock, OAM

Director of the Emergency Department, Associate Professor Carmel Crock received a Medal of the Order of Australia (OAM) 2021 for service to emergency medicine, and to medical education.

"As an Emergency Department doctor, you're always a part of a team, and I received this honour for my team. Nothing I do, I could do on my own. I'm proud to be part of a speciality that never closes; there is always someone there to help those in need," she said.

Associate Professor Crock has been part of the Eye and Ear team for over 20 years and is a passionate advocate of diagnostic excellence, shared decision-making and the quality and safety of patient care.

In October 2020, Associate Professor Crock also received the Mark L. Graber Diagnostic Quality Award. The award is given to a person, group, or organisation that has made important contributions to the reduction of diagnostic error.

Associate Professor Anne Brooks, AM

Ophthalmologist and Head of Special Eye Clinic 3, Associate Professor Anne Brooks was appointed a Member of the Order of Australia (AM) for significant service to ophthalmology, and to eye health organisations.

Associate Professor Brooks has a passion for teaching registrars in clinical ophthalmology and was the first female to be awarded the RANZCO College Medal in 2019.

"I felt very pleased to be recognised like this and very grateful to all the people who have helped me to achieve what I have," Associate Professor Brooks said.

Dr Richard Stawell, AM

Former Chief of Medical Staff and ophthalmologist, Dr Richard Stawell was also appointed a Member of the Order of Australia (AM) for his significant service to ophthalmology, to research, and to professional bodies.

Dr Stawell became interested in ophthalmology as an intern at Wangaratta Base Hospital, when the consultant ophthalmologist was not able to manage microsurgery due to a medical problem and taught him how to do basic perforating eye injury repairs.

"I felt both humbled and honoured that some of my colleagues had felt I deserved it and went to the trouble to put forward my name," Dr Stawell stated in response to his honour.

We are proud to have such dedicated clinicians who are experts in their field a part of the Eye and Ear community.

Finding the fault

Patient Fred Scharkosi first experienced vision loss in his late 20s and was prescribed cortisone tablets which made a significant improvement. It wasn't until his early 50s when his vision began to deteriorate more rapidly that Dr David Fabinyi diagnosed macular dystrophy.

"I consider myself to be quite a tenacious person and so I continued to push for more referrals seeking treatment options. This is when I saw Dr Jon Ruddle who ran more tests and he believed that there may be a faulty gene in my eye causing the issues," Fred said.

It was initially suspected that Fred had Stargardt disease – the most common form of macular dystrophy - but he was later found to have a very rare genetic variant of macular dystrophy with treatment not yet known.

"When I was at the hospital for testing, coincidentally Professor Alex Hewitt's Clinical Genetics Group was meeting the same day, and this is when I agreed to be involved in the trial," he said. "They took a skin sample from my arm and some blood. These are then used to create stem cells which in the laboratory can be turned into retinal cells. "If everything lines up, we will be able to identify the faulty gene and repair it to create a new retina. Everyone at the Eye and Ear has been fantastic and are so passionate in wanting to help others and improve their quality of life."

Fred's persistence is admirable and we are proud to support his eye health journey.

Fred's persistence is admirable and we are proud to support his eye health journey.

↗ IMAGE CAPTION: PATIENT FRED SCHARKOSI

Innovations at the Eye and Ear

At the Eye and Ear we are committed to acting on patient feedback and coming up with innovative solutions to streamline the patient experience. This year, we launched two technologies that create a more efficient hospital environment for both patients and staff.

Patient self-check-in

Nobody enjoys having to queue and so in February 2021, we launched our first patient self-check-in kiosk in our Acute Ophthalmology Service (AOS) clinic. This development marks a significant step forward in striving for a better patient experience by easing wait times, congested waiting rooms and reception queues.

The kiosk allows patients to digitally register their arrival using touch-screen technology without the need to go to the physical reception desk. Digital calling screens in clinic waiting areas then alert patients when their clinician is ready to see them.

This kiosk is a tangible response to the feedback we received from patients, and represents a large body of work undertaken by a project team made up of Ambulatory Services and the Outpatient Bookings Unit.

As with all decisions that impact our patients, valuable input was sought from consumers and AOS clinical and clerical staff.

Electronic Medical Record

In a further commitment to providing an outstanding patient experience, the hospital rolled out its Electronic Medical Record (EMR) system in early 2021. The EMR allows for patient medical information to be housed on a secure electronic medical record platform. The EMR project started in October 2019. The platform is supported by Cerner solutions and utilises FirstNet in the Emergency Department (ED) and PowerChart Ambulatory in the Acute Ophthalmology Specialist Clinic (AOS.)

The implementation of the EMR means that all patient information such as relevant patient history, medications, test results and assessments are available in one place, making it easier for our staff to make more tailored and informed decisions.

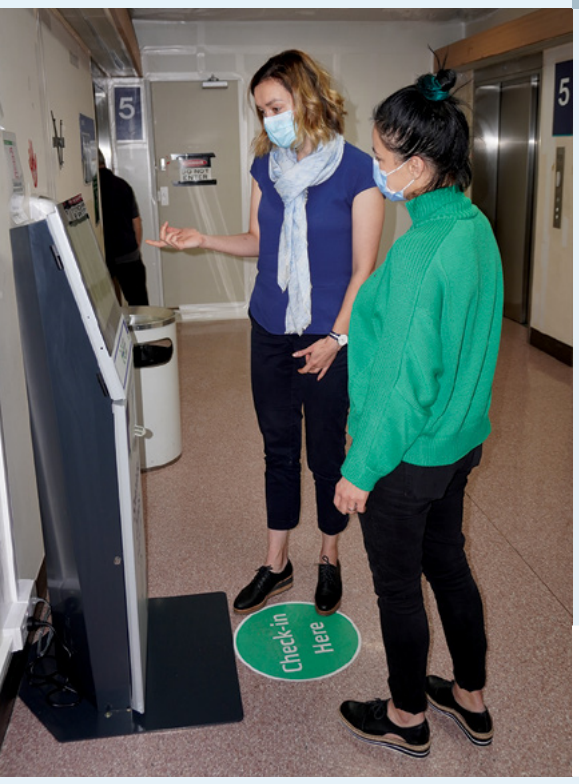
This technology is a major transformation for the Eye and Ear, providing a range of benefits for patients, clinical and non-clinical staff, including the potential for:

- improved access to timely, consistent and less fragmented clinical documentation, decreasing clinic risk to patients
- reduction in medical and nursing time spent documenting in ED due to electronic notes
- real-time discharge summary or letter for all patients presenting at ED and AOS
- reduction in paper, printing, and stationary costs
- reduction in retrieval costs of information from other facilities
- reduction in medical record scanning and medical record preparation cost
- reduction in medication errors in ED due to electronic process for selection of medications from Omnicell
- improvement in adverse drug reaction documentation in Cerner in ED.

ED Director, Associate Professor Carmel Crock reflects on the technology and the improvements to the patient journey.

"The implementation of the EMR has created many efficiencies in the Emergency Department, most notably it has helped to reduce the amount of time our medical and nursing staff take to document their case notes," Dr Crock said. "The digital notes make for faster processing of our patients."

Thank you to the eHealth project team who worked on the delivery of this project that has seen many hospital-wide improvements.



↑ IMAGE CAPTION: SELECTION OF PHOTOS FROM THE LAUNCH DAY OF THE ELECTRONIC MEDICAL RECORD ROLLOUT IN EMERGENCY DEPARTMENT AND ACUTE OPHTHALMOLOGY SERVICE

Supporting Aboriginal patients

In enhancing accessibility for all Victorians, the Eye and Ear strives to provide maximum support for our Aboriginal and Torres Strait Islander community. In the 2020–21 financial year, 0.8 per cent of patients identified as Aboriginal and Torres Strait Islander. These patients have a higher incidence of eye disease, with one in nine Indigenous Australians experiencing vision impairment or blindness.

The end of 2019 marked the official opening of a new specialist eye clinic for Aboriginal and Torres Strait Islander patients, a partnership between the Eye and Ear and the Victorian Aboriginal Health Service (VAHS.) The full-service clinic was the first of its kind to operate within an Aboriginal Community Controlled Health Organisation (ACCHO) in Australia. The monthly Healthy Ears Clinic is also supported by Eye and Ear clinical staff at VAHS. The Eye and Ear works closely with VAHS to facilitate culturally appropriate care for Aboriginal and Torres Strait Islander patients, with the support of our two dedicated Aboriginal Health Liaison Officers.

In 2020, we successfully launched our Innovate Reconciliation Action Plan (RAP), which followed the successful Reflect RAP of 2019. These plans are an important step towards formalising the organisation's commitment to continuing our reconciliation journey. To further embed Aboriginal cultural awareness across the organisation, an e-learning package was also launched in 2020 to enhance staff's cultural competency when supporting our Aboriginal and Torres Strait islander patients.

"After the launch in April 2020, the hospital's Aboriginal Cultural Awareness e-learning package has seen a 91 percent staff completion rate," said Carleen Miller, Aboriginal Health Liaison Officer. "The package includes topics such as: the history of colonisation and segregation; the Stolen Generation; legislation and political history; significant historical events for the Aboriginal community; and cultural practices and how to provide a culturally safe environment for Aboriginal and Torres Strait Islander patients, carers and staff."

At the Eye and Ear, we strive to be a diverse, inclusive and culturally safe employer-of-choice for Aboriginal people. The Department of Health (DH) in partnership with Aboriginal and Torres Strait Islander communities and organisations have worked together for a number of years towards achieving holistic health, wellbeing and safety for Victorian Aboriginal communities. In the first part of 2021, we reviewed and implemented our Aboriginal Employment Plan. The Eye and Ear's AEP has been updated in line with both Reconciliation Action Plans. The AEP aligns closely with the key focus areas for implementing health sector system reform as detailed in the *Korin Korin Balit-Djak Aboriginal health, wellbeing and safety strategic plan 2017–2027.*

"The Aboriginal Employment Plan is a key milestone for the hospital in continuing our efforts in creating a safe, respectful and welcoming environment for all current and prospective Aboriginal and Torres Strait Islander employees," said Brendon Gardner, CEO, The Royal Victorian Eye and Ear Hospital.

↑ IMAGE CAPTION: PATIENT KEVIN AND ABORIGINAL HEALTH LIAISON OFFICER, NATALIE

Collier Charitable Fund: funding the Eye and Ear for 17 years

The Collier Charitable Fund was established in 1954 by Alice, Annette and Edith Collier, three Melbourne sisters, as a way to continue, in perpetuity, their lifelong practise of generous support of charities and of the disadvantaged.

The fund has been supporting the Eye and Ear for over 17 years, with particular focus on education and training, contributing about $390,000 to the hospital during this time.

In particular, this money has funded a range of projects including:

- state-of-the-art microscopes for eye surgery
- bronchoscopy simulator equipment for trainee clinicians to improve airway management skills
- a GP and Emergency Medical Practitioners Education Program.

Wendy Lewis has been Executive Officer at Collier for six years and is passionate about philanthropy, social enterprise and utilising technology to bring people together.

"I support the Trustees in implementing and integrating the strategic direction of the fund in accordance with the purposes as set out in the wills of the sisters," Wendy explained.

"I admire the sisters' passion for philanthropy. The foresight and generosity of these three unassuming early Australian philanthropists continues to contribute to the welfare of the Australian people today"

Within the Trust there are seven designated funds of which five are available to accept applications in the annual grant round:

- Fund 1: Public benevolent institutions in Victoria
- Fund 2: Public hospitals in Victoria
- Fund 3: Public educational purposes in Australia
- Fund 4: Religious purposes in Australia
- Fund 5: Relief of poverty in Australia, the Australian Red Cross, the education of children of deceased or incapacitated sailors, soldiers or sirmen or any other charitable purposes not otherwise provided for in any of the previous categories.

The terms of the wills give the Trustees discretion in making their decisions on what they choose to fund in support of the designated purposes.

Annette, Alice and Edith Collier were the daughters of a prominent grazier and contractor, Jenkin Collier. He was born in Wales in 1829, immigrated to Australia when he was 23 and died aged 91 in 1921 after a long and very successful career as an engineering contractor, a builder of railways and a pastoralist. He left his considerable wealth to his three unmarried daughters. The sisters lived simply and unpretentiously and gave generously but anonymously from their income to charities and people in need.

"I admire the sisters' passion for philanthropy. The foresight and generosity of these three unassuming early Australian philanthropists continues to contribute to the welfare of the Australian people today," Wendy said.

↑ IMAGE CAPTION: THE THREE COLLIER SISTERS ALICE, ANNETTE AND EDITH, FOUNDERS OF THE COLLIER CHARITABLE FUND

Rising stars

If the past year has underscored anything it is the unwavering dedication of our staff. As Australia's only specialist eye, ear, nose and throat hospital, our clinicians are world class, some with tenures spanning two decades. As we look to the future at the Eye and Ear we see the faces who have risen up, and who continue to rise up to meet every challenge.

Nursing
Marnee Ackerly, Registered Nurse
Since Marnee completed her graduate nurse program with us in 2016, she has continued to seek ways to broaden her professional portfolio and scope of practice. In 2020, Marnee stepped up at short notice and took on the role of Acting Nurse Unit Manager (NUM) of the Day Surgery Facility (DSF). Marnee also provided virtual support to the Day Surgery staff required to work from home during the period of shutdown related to the COVID-19 pandemic in 2020. A quiet achiever, Marnee is a team player who draws upon the strong network of clinicians within the Day Surgery team.

Diagnostic Eye Services
Kahina Terbah, Grade 1 Orthoptist
Kahina has worked at the Eye and Ear since 2016 and has been instrumental in improving the workflow around the Ocular Immunology and Rheumatology clinics. Demonstrating leadership for other staff on the clinic floor, Kahina actively seeks and suggests improvements in her work area. With a passion for continuous improvement, Kahina has worked on providing better flow for the immunosuppressed patient pathway by sharing the patient allocation among the orthoptic staff.

Pharmacy
Neeva Maskey Shrestha, Senior Clinical Pharmacist
Neeva joined the Eye and Ear as a Clinical and Medication Safety Pharmacist in 2015. During her time in this role, Neeva has made significant contributions in supporting the National Standard (NS) 4 Medication Safety Program.

In early 2021, Neeva was appointed as Senior Clinical Pharmacist and has taken every new responsibility in her stride, including leading a team of five clinical pharmacists. Neeva approaches all tasks with enthusiasm and diligence, understanding the importance of learning the responsibilities of everyone in the team including inventory systems and Deputy Director of Pharmacy duties.

Audiology
Jenny Nguyen, Audiologist
Jenny joined the Eye and Ear as a grade 1 Audiologist in 2015 and has excelled in every task that has come her way, ensuring patient centred care is at the core of her work.

Jenny works in General Audiology and Balance services and she has not steered away from responsibility. She is always seeking opportunities to contribute to the team and the hospital more broadly. This includes training

and mentoring other audiologists, student education, digitising processes, coordinating division-wide professional development and leading research projects to improve the overall patient experience.

Ophthalmology

Dr Micheal O'Rourke, Orbital, Plastic and Lacrimal (OPAL) Fellow

Dr O'Rourke began working at the Eye and Ear in February 2020 as an Orbital, Plastic and Lacrimal (OPAL) Fellow. Micheal completed his ophthalmic surgery qualifications with The Royal College of Surgeons in Ireland (RCSI) and The Irish College of Ophthalmologists in 2019. He later went on to complete an OPAL Fellowship at Manchester Royal Eye Hospital, before moving to Melbourne.

Micheal specialises in orbital, oculoplastics and lacrimal disorders and has a keen interest in clinical research, with his current projects focusing on the areas of orbital lymphoma and orbital cellulitis. Early in the COVID-19 pandemic, Micheal described the measures taken by the OPAL Unit at the Eye and Ear to deliver care which was published in the leading journal, *Ophthalmic Plastic and Reconstructive Surgery* (OPRS).

Dr Doron Hickey, Ophthalmology Registrar

Dr Doron Hickey started working at the Eye and Ear in 2018 as an ophthalmology registrar. His primary interest is in gene therapy for inherited retinal dystrophies (IRDs). Doron's PhD investigated how vision could be restored to the blind retina using optogenetic gene therapy to control the activity of neurons (nerve cells) using light and genetic engineering.

Dr Hickey is currently a co-investigator on a research project developing novel therapies for retinal diseases, and this year has been a member of the team working on a clinical trial for a gene therapy for AMD delivered by sub-retinal injection.

William Mitchell, 1st year Eye Registrar Ophthalmology trainee

William Mitchell is a clinical researcher and John Monash Scholar from Central Australia, with a keen interest in global and public health, and rural and remote ophthalmology.

William has conducted a significant amount of epidemiological ophthalmic research. He is currently completing an analysis on predicting patients who are most likely to benefit from minimally invasive glaucoma surgery. In 2020, William co-authored an article published in the *Medical Journal of Australia* entitled *Long term outcomes for Aboriginal and Torres Strait Islander Australians after hospital intensive care.'* The paper was shortlisted for the *MJA*/ MDA National Prize for Excellence in Medical Research.

Our partners

The Royal Victorian Eye and Ear Hospital is affiliated with:

- The Centre for Eye Research Australia
- The Australian College of Optometry
- Bionic Vision Technologies
- Cochlear Australia
- The Department of Health
- La Trobe University
- Lions Eye Donation Service Melbourne
- The Bionics Institute
- The Deafness Foundation
- The HEARing CRC (Cooperative Research Centre)
- The University of Melbourne
- Victorian Aboriginal Health Service
- Victorian HealthCare Building Authority

The Royal Victorian Eye and Ear Hospital is a member of:

The World Association of Eye Hospitals

Members: Aier Eye Hospital Group (China); Emory Eye Center (Atlanta, USA); Eye & ENT Hospital Fudan University (Shanghai, China); Fondation Asile des Aveugles (Lausanne, Switzerland); Hoftalon Eye Hospital (Londrina, Brasil); Ispahani Islamia Eye Institute & Hospital (Bangladesh, India); Jakarta Eye Center (Jakarta, Indonesia); Kellogg Eye Center (Ann Arbor, USA); Kim's Eye Hospital (Seoul, South Korea); King Khaled Eye Specialist Hospital (Riyadh, Saudi Arabia); Magrabi Eye Hospital (Saudi Arabia); Massachusetts Eye and Ear Infirmary (Massachusetts, USA); Moorfields Eye Hospital (London, UK); New York Eye and Ear Infirmary (New York, USA); Orenburg branch of S. Fyodorov Eye Microsurgery Federal State Institution (Orenburg, Russia) 2020; Phillips Eye Institute (Minneapolis, USA); Rutnin Eye Hospital (Bangkok, Thailand); Singapore National Eye Centre (Singapore); St. Erik Eye Hospital (Stockholm, Sweden); St. John of Jerusalem Eye Hospital (Jerusalem, Israel); Sydney Eye Hospital (Sydney, Australia); The Beijing TONGREN Hospital (Beijing, China); The Metta Eye Hospital (Mettapracharak (Wat Rai Khing) Hospital) (Bangkok – Thailand); The Niteroi Eye Hospital (Rio de Janeiro, Brasil); The Rotterdam Eye Hospital (Rotterdam, The Netherlands); The Royal Victoria Eye and Ear Hospital (Dublin, Ireland); The Xi'an Eye Hospital (Xi'an, China); Tianjin Medical University Eye Hospital (Tianjin, China);Tun Hussein Onn National Eye Hospital (Kuala Lumpur, Malaysia); Turin Ophthalmic Hospital (Turin, Italy); UCSF Eye Health (San Francisco, USA); Wills Eye Hospital (Philadelphia, USA); Wilmer Eye Institute at Johns Hopkins (Baltimore, USA)

The American Association of Eye and Ear Centers of Excellence

Members: Bascom Palmer Eye Institute (Florida, USA); Emory Eye Center (Georgia, USA); The University of California, San Francisco Medical Center (San Francisco, USA); Massachusetts Eye and Ear Infirmary (Massachusetts, USA); Moorfields Eye Hospital (London, UK); Wills Eye Hospital (Philadelphia, USA); Phillips Eye Institute (Minnesota, USA); Rutnin Eye Hospital (Bangkok, Thailand); Singapore National Eye Centre (Singapore); St. Erik's Eye Hospital (Stockholm, Sweden); Wilmer Eye Institute at Johns Hopkins (Baltimore, USA)

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