Pink eye is an initial symptom that some individuals with the COVID-19 disease (official name for the virus SARS-CoV-2) experience. This raises the possibility that the eye, much like the lungs, might also be a gateway for disease transmission.

Soon after the COVID outbreak, Shiley Eye Institute physicians and researchers Karl Wahlin, PhD, Natalie Afshari, MD, Brad Barnett, MD, Dan Chao, MD, PhD, Derek Welsbie, MD, PhD, and Doran Spencer, MD, PhD convened weekly meetings to discuss what is known about COVID and eye transmission. The sobering conclusion was that the field knew little about the actual mode of transmission of this disease. New research was needed!

In an effort to begin studying COVID in the eye, Dr. Wahlin’s research group used human stem cell-based 3-dimensional corneal organoid technology that his laboratory developed to test whether COVID could be transmitted to human ocular tissues.
Partnering up with Jair Lage de Siqueira-Neto, PhD, an infectious disease expert at the SKAGGS School of Pharmacy at UC San Diego, they infected these cells and showed for the first time that laboratory grown human corneas could be readily infected with COVID. This now provides researchers a new way to explore COVID transmission in human tissues.

The group plans to adapt this new 3-D technology as a platform to screen FDA approved drug compounds that can potentially block viral transmission.

(Left) Cells isolated from laboratory grown organoids were infected with active SARS-COVID19 virus and labeled with antibodies that recognize the viral protein.

SEI PARTNERS WITH UC SAN DIEGO BIOENGINEERING STUDENTS

UC San Diego has tremendously talented students that can address real world problems with creative solutions. Every year, the Department of Bioengineering (BENG) holds a year-long senior design project that pairs students with faculty advisors to develop a project from initial conception to a working prototype.

Karl Wahlin, PhD advised a team of highly motivated students (Devansh Agarwal, Garret Almeida, Johny Koo, Haojin Chen, Meghna Bahry and Kha Nguyen) this year to build 3-D printed self-feeding cell culture prototypes that will feed stem cell generated human retina organoids (and other cells). Not only will this reduce the amount of labor involved to carry out this work, but it is expected to lead to more reliable results for future experiments.

The work that the BENG team is doing addresses a major bottleneck in stem cell research and will have a lasting impact well after COVID has vanished. Shiley Eye Institute scientists collaborating with other UC San Diego departments accelerate the pace of discoveries and development of novel devices.

(Right) Biomedical engineering students testing the flowrate of a 3D printed microfluidic device.
SHILEY HEROES

A tribute to our frontline clinical staff that continue to serve our patients during the COVID-19 pandemic 2020
In response to the COVID-19 crisis, the Shiley Eye Institute (SEI) doctors are finding ways to care safely for their patients, including telehealth. Live two-way audiovisual visits are offered with some of our providers to limit person-to-person contact. These “virtual” visits take place on a smartphone, computer or tablet using specialized software at UC San Diego Health.

Not all eye health concerns can be addressed via telehealth but we have made great efforts, particularly in triage, optometry, pediatric ophthalmology and neuro-ophthalmology.

Our first telehealth pediatric ophthalmology patient was seen on April 2, 2020 with Shira Robbins, MD, Professor of Ophthalmology at the Anne F. and Abraham Ratner Children’s Eye Center. From Dr. Robbins perspective:

Our video visit has a virtual waiting room where ophthalmic technicians, Marie Montez or Gustavo Wanderer, “check in the patient,” ask the reason for the visit and obtain a medical history. Orthoptist Erika Acera then performs a live eye movement exam followed by the medical examination performed by pediatric ophthalmology fellow Kirsta Brummel, DO.

I have been watching the full visit on my computer screen so I can then ask follow up questions and perform any additional examination before providing a final diagnosis and treatment plan. Before the visit, patients are asked to check their vision with the phone application (app) Kay iSight or a paper chart that we send and to photograph their eye movements with an app called 9 Gaze. This does not replace the greater accuracy of an in-person exam but allows us to take care of our non-urgent patients in this time of pandemic.

In the Viterbi Family Department of Ophthalmology, we are always looking for better ways to care for our patients. I was lucky to have a great group at Ratner to assist me in launching this new system. Thank you to my outstanding telehealth team: Marie Montez, Gustavo Wanderer, Erika Acera, Kirsta Brummel, DO and Andrea Johnson.

When it comes to eye health, telehealth sometimes makes it challenging to diagnose and treat patients. However,
sometimes there is no alternative. A patient called with new symptoms of double vision but refused an in-person visit because of fears about COVID-19.

“I had a video visit with her that day and diagnosed a new onset sixth nerve palsy, a disorder that causes your eye to cross inward towards your nose. There are many possible causes but because she also had vertigo, I was concerned for a significant brain disease,” said Dr. Robbins. “I ordered an immediate MRI. The scan revealed a giant brain aneurysm. We then transferred the patient to neurosurgery and endovascular surgery all through telehealth. It can work with the right patient and right set up. I am so glad she called - as we likely saved her life.”

She continued, “I plan to continue some telehealth visits for certain types of patients going forward. I love that COVID-19 made me try something new which I will continue to use to care for patients long after the pandemic is over.”

SHILEY EYEMOBILE FOR CHILDREN

COVID-19 severely impacted the ability for the UC San Diego Shiley EyeMobile for Children to travel in the community to see youngsters around San Diego in the school locations. During the initial closure of schools, the EyeMobile was transformed into a mobile triage unit stationed in front of the Shiley Eye Institute and staffed by optometrists in full personal protective equipment. The doctors were able to examine patients that were suspected of having COVID-19 symptoms which allowed the Shiley clinic to remain available by limiting exposure to our other patients.

While the EyeMobile was being utilized as a triage unit, the staff completed comprehensive compliance calls to all of the families of children who wear glasses. Unfortunately, it was evident that many of the children had left their glasses in their closed classrooms. Therefore, the EyeMobile team quickly swung into action by replacing all of those glasses that were left behind. The parents were followed up with and given further information on the importance of wearing glasses and their children’s development.

We are happy to report that COVID-19 didn’t completely close down the EyeMobile. In the summer, the EyeMobile began scheduled visits to various cities in the county maintaining our mission - that all children have access to high quality vision care. The fact that children are not attending school in classrooms does not mean they do not need the EyeMobile services. Although a different model, the EyeMobile is continuing to provide no cost exams and glasses to children ages 3-14 in community locations around San Diego County.
Inspired by stories of health care workers in dire need of personal protective equipment (PPE), Bishop's School sophomore Justin Korn decided to join the battle against COVID-19.

Justin's father, Bobby Korn, MD, PhD, Professor of Ophthalmology at the UC San Diego Shiley Eye Institute, recounted the story of Dr. Li Wenliang. He was an ophthalmologist and one of the first physicians in China to sound the alarm about this novel viral illness spreading throughout his country. Unfortunately, he succumbed to the disease at the young age of 33. Justin began to question his father about why eye doctors in particular are at high risk. Dr. Korn explained that the procedures of performing eye exams and treatments are in close proximity to patients.

Simultaneously, Dr. Korn was discussing the same issue with David Granet, MD, Professor and Director of the Ratner Children's Eye Center. Both observed that the standard face shields worn across the forehead do not allow ophthalmologists to carefully examine the retina or to check the refractive state of children's eyes in a safe manner. One can wear an N95 mask but then cannot use the specialized equipment that eye doctors utilize every day and still protect the eyes and face from aerosolization of the virus. Justin overheard the conversation and took up the challenge!

Justin's first challenge was to design a safeguard that would integrate a face shield with an indirect ophthalmoscope (the microscope that allows visualization of the structures inside the eye) that is already mounted around the forehead. At that time, there was no commercially available face shield that will couple with an indirect ophthalmoscope. One can wear a standard face shield but it cannot be used simultaneously with an indirect, especially if one wears glasses.

Justin took measurements of the device and designed a prototype on a 3D modeling program. Within a few hours, he
created a working model from his 3D printer. The first designs were too flimsy and didn’t provide enough side protection so he went back to the drawing board and came up with several new iterations. He finally settled on a model that could be quickly produced and hold up to the stresses of daily clinical use. Justin then spent every waking hour printing as many indirect ophthalmoscope shields as he could.

Shortly after delivering shields to the Shiley Eye Institute, Justin was contacted by Shira Robbins, MD, Professor of Ophthalmology at the Ratner Children’s Eye Center. Dr. Robbins asked Justin to create a specialized facial shield for a device she uses to check the refractive state of children’s eyes (whether glasses are needed). This handheld device, known as a retinoscope, is used in close proximity to a child’s eyes and this distance poses risks for the patient and doctor. Again, Justin went back to his design lab and fabricated a new model on his 3D printer. In just a few days, he had produced enough for the Ratner Children’s Eye Center.

Justin has since produced ophthalmic shields for doctors at the VA San Diego Health Care System and has made his designs freely available at the National Institute of Health (NIH) 3D Print Exchange (3dprint.nih.gov). The FDA has authorized the use of 3D printed face shields under the Emergency Use Authorization (EUA).

Oliver Solis, OD, a community optometrist at San Ysidro Health which was heavily affected by COVID-19, contacted the Shiley Eye Institute in response to our social media postings. He requested and received ophthalmic shields made by Justin Korn at no cost.

Dr. Solis commented, “The pandemic revealed that we are all very much interconnected and that personal protective equipment helps to stop the spread of this virus. Fortunately there are people like Justin Korn who rose to the challenge. He really made a difference during this crisis. Thank you Justin and Dr. Korn for helping us through this pandemic. We are grateful for your assistance.”
Q. HOW HAS THE PANDEMIC CHANGED YOUR SHORT-TERM PRIORITIES?

The pandemic quickly forced me to think in units of hours and days instead of months and years. As a new faculty member, my priorities had been building my clinical practice, research team, and educational efforts. My eyes were focused down the road on things like our new multidisciplinary, endoscopic orbital surgery course. Suddenly, as COVID-19 swept through New York, we lost our sense of horizon. My priorities simplified and my focus sharpened on each day. I prioritized maintaining my health and finding creative ways to engage, support, and educate our community. Substituting long-term vision for short-term focus has helped me put one foot in front of the other and keep moving forward. I have also tried to practice daily gratitude for my health, for the health of my family, and for having a job that allows me to help others.

Q. WHAT ARE YOU DOING NOW THAT YOU WOULD NOT HAVE DONE OTHERWISE?

In addition to telemedicine, virtual lectures, and limited emergency orbit and oculofacial surgeries, I am volunteering as an attending physician in the emergency department (ED). In this new role, I am caring for COVID-19 and appropriate general emergency patients to help decompress clinical volume. This effort is supporting and bolstering the ranks of emergency clinicians who have been tirelessly and courageously caring for the influx of sick patients at multiple hospitals.

Q. HOW DID YOU GET INVOLVED?

As the clinical volume surged in New York, our chairman asked for volunteers to support the hospital mission, and I agreed to help. At that time, the need was in the ED. Although I was initially intimidated by the thought of returning to an emergency medicine role, the support I received made for an effective transition.
Q. WHAT ARE THE BIGGEST REWARDS?
Without question, the gratitude of my new emergency medicine patients and colleagues means a lot. The reception I receive each day in the ED and in our hospital—applause, food donations, chalk messages on the sidewalk, notes from patients—provide a tangible sense of purpose and solidarity. The coordinated hospital response has also been a reminder for me that medicine is a team sport. In ophthalmology, we often function in small, highly specialized units at some distance from the rest of medicine. However, being a part of the hospital’s massive, coordinated response at the front lines of this crisis reminded me how much more powerful and effective we can be when collaborating, communicating, and working together for a common purpose. To see our hospital system not just survive but also take care of our community at the highest level has been a huge reward, and I know it has set an example for other departments around the city and country.

Q. WHAT ARE YOUR GREATEST CONCERNS?
My greatest concern had been that at the peak of the local curve we would not have sufficient resources or space to care for everyone who came through our doors. Thankfully, due to the exceptional efforts and leadership at our hospital, this did not happen. We have been well protected and well organized, and we have been able to care for everyone with a remarkably high level of success. Secondarily, I also empathize with any concerns our residents and fellows are feeling about their own training experiences (although none have expressed anything other than a desire to help). However, our residents and fellows are fortunate to have a dynamic and high-volume learning environment, and I am confident that they will graduate as competent and well-trained clinicians and surgeons.

Q. WHAT ARE YOUR BIGGEST CHALLENGES DAY TO DAY?
Although I miss operating and the daily interactions with my colleagues in our department, I have enjoyed the new challenge of clinical work in the ED. Quickly transitioning to a new field pushed me cognitively, physically, and emotionally, but it has been tremendously rewarding. From a clinical perspective, the COVID-19 treatment algorithms have been effective in guiding our coordinated, resource-efficient response, and they have contributed to our success. Additionally, the support of the staff, including technicians, nurses, nurse practitioners, physician assistants, residents, and attending physicians in the ED has been crucial to my ability to care for these sick patients.

Q. WHAT DO YOU SEE AS THE IMPACT OF WHAT YOU ARE DOING?
I am only playing a small role in a large and complex group effort, but I think standing shoulder to shoulder with my new ED colleagues helped reinforce for them that no department, clinician, or patient will be left behind, and that we are all pushing back against the tide of this disease together.

Q. WHAT’S YOUR PERSPECTIVE ON THE PANDEMIC?
I think the perennial importance of positivity, gratitude, and service have emerged for me. Although the losses are overwhelming, I think we can all find reasons to be positive. This perspective empowers us for the important work ahead. From a place of gratitude, I think we are all capable of contributing something. I have been inspired by the creative ways people have found to serve others and contribute. I am also continually inspired by the work of all essential employees who have kept our hospital, city, and country going. From transit workers to grocers to police officers, I have tried to say thank you at every opportunity.

Q. WHAT ARE YOUR THOUGHTS ON BEING AN OPHTHALMOLOGIST DURING THE COVID CRISIS?
From a medical perspective, a crisis of this magnitude requires us to contribute our full effort, at the top of our training, to the areas of greatest need. Our first impulse must be to help in every way possible. Although we are fortunate to have highly specialized microsurgical skills that allow us to prevent and cure blindness, we were first physicians trained in the diagnosis and treatment of systemic illness. We have more to offer our patients than we may initially believe.