

UNIVERSITY OF COLORADO SCHOOL OF MEDICINE

CUMEDICINE

Today

Eyes on AI

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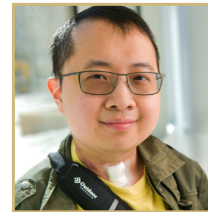


On the Cover

Malik Kahook, MD, says artificial intelligence could help make a diagnosis more objective.

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OFFICE OF ALUMNI RELATIONS
13001 E. 17th Pl., Mailstop A080
Aurora, CO 80045
E-mail: healthalumni@ucdenver.edu
303-724-2518/877-HSC-ALUM
www.ucdenver.edu/healthalumni

SCHOOL OF MEDICINE
John J. Reilly, Jr., MD
Dean; Vice Chancellor for Health Affairs,
University of Colorado

EDITOR
Mark Couch
Chief of Staff,
Associate Dean of
Public Relations

ASSISTANT EDITOR
Chanthy Na
Director of Communications
and Marketing

PHOTOGRAPHY
Justin LeVett
Cyrus McCrimmon

WEB CONTENT
Tonia Twichell

PRODUCTION
CU Design & Print
Services

WRITERS
Mark Couch
Greg Glasgow
Kara Mason
Colleen Miracle
Todd Neff
Tyler Smith

BETTER FASTER

This past summer, The Anschutz Foundation announced that it is giving our campus \$50 million to support our faculty in their efforts to reach patients with health care innovations. The Anschutz Acceleration Initiative is designed to give a boost to projects that are poised to make a direct patient impact within the next three to five years.

A notable feature of this support is the range of projects that it covers. The definition of innovation is broad enough to address population health, innovative treatments and diagnostics, novel therapeutic development, medical devices, and digital health technologies.

We are fortunate at the School of Medicine to have a deep bench of investigators who are expanding the boundaries of our knowledge in all these areas of human health. We also have strong hospital partners where we provide the high-quality care that patients need. This gift from The Anschutz Foundation is an opportunity to push some discoveries into action sooner rather than later.

With the funding, we expect to support up to seven projects. To select those, we are conducting a thorough review process that includes outside experts. More than 160 letters of intent were submitted to our initial call for projects, and about half of those were invited to provide full proposals. The campus expects to announce selected projects in early 2024.

Projects will be evaluated based on the potential to deliver direct patient impact within five years. For projects focused on public health and prevention, addressing mental health needs may be prioritized. For projects focused on innovation, those showing economic impact through private partnerships and external investments may be prioritized. All projects must be multidisciplinary and leverage existing campus strengths and expertise.

The review committee's task is formidable because we have so many talented faculty and staff submitting proposals, but we are confident the process will inspire many to pursue their projects even if they are not selected for this funding.

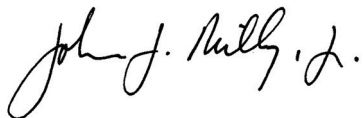
The Anschutz Foundation's support has been vital to the development of our world-class academic medical center. Its steadfast commitment has allowed our campus to invest wisely and grow programs that attract talented faculty and staff, who in turn strengthen our work and extend our reach.

When we announced the Anschutz Acceleration Initiative, CU Anschutz Medical Campus Chancellor Donald Elliman described why the foundation's support for our campus has been so successful. "They have gone beyond investing in the physical growth of this campus," he said. "They have also championed the people and programs that drive innovation here."

In 2015, when I became Dean, the foundation's substantial support for the transformational research projects raised our national profile and the researchers in those programs continue to produce impactful scientific research. Those programs have deepened our understanding of fundamental building blocks of our health.

With the Anschutz Acceleration Initiative, we are now aiming to help patients and communities get better faster through investments in treatments and technologies that can be deployed quickly here and in health care settings across the country.

With warm regards,



John J. Reilly, Jr., MD
 Richard D. Krugman Endowed Chair
 Dean, School of Medicine
 Vice Chancellor for Health Affairs
 University of Colorado



Reporters locally and nationally turn to the School of Medicine for expertise and research news. Here are some examples from near and far.

Lisa Brenner, PhD, professor of physical medicine and rehabilitation and director of the Department of Veterans Affairs-affiliated Rocky Mountain Mental Illness Research, Education and Clinical Center, discussed her study on the lifelong consequences of traumatic brain injury in an August report in *Time*. “In the early days, when folks were coming back from Iraq and Afghanistan, we spent a lot of time and energy trying to figure out, ‘Is this TBI? Is this PTSD? Is this both?’” she said. “The veterans, they weren’t thinking about themselves like that.”

Maya Bunik, MD, MPH, professor of pediatrics, applauded a study finding that breastfeeding is a cost-effective way to reduce infant deaths. “If every mother could get breastfeeding support in the first week of life, we could make their journey much less challenging,” she said in an August report by *HealthDay*. “We encourage birthing classes as a society, but a breastfeeding class should be a critical part of how we think about preparing a family to have a baby.”

Richard Schulick, MD, MBA, chair of surgery and director of the University of Colorado Cancer Center, emphasized the importance of outreach efforts to address disparities. Compared with other states, Hispanic residents in Colorado suffer higher rates of lung, breast, and colorectal cancers, so, in 2020, the center disbursed five grants of \$100,000 each to research groups to investigate how to better include all Coloradans in the services it provides. “Prevention, early detection, and great therapies don’t mean much if we’re not disseminating those things to our community,” he said in an article in August issue of *5280* magazine.

Thomas Pshak, MD, associate professor of surgery, described completing the first liver transplant in Colorado using an advanced robot, in an August news report on Denver-based *Fox31*. “The four robotic arms are all controlled by the surgeon, but in the manner that they’re tiny little hands, and they’re even



Thomas Pshak, MD

more accurate than the human hand,” he said. “I can make the robot do things with stitches that I can’t do with my hands.”

Eric Simões, MD, clinical professor of pediatrics, was quoted by National Public Radio in August in a report on a new RSV vaccine for expectant mothers that is aimed at protecting newborn babies. “My only hope is that we can get these vaccines not only in the U.S., but also to children in developing countries that need it the most,” he said.

Emmy Betz, MD, MPH, professor of emergency medicine and director of the Firearm Injury Prevention Initiative, was quoted in August in an article in the *Stevens Point Journal* about a Wisconsin suicide-prevention program that involves gun shops as safe storage sites. She said people in crisis always need a way to voluntarily surrender their guns. “I think it’s really offensive, actually, to imply that those adults with suicide risk should not be involved in their own safety planning and care,” she said. “I mean that’s the underlying principle for treatment of adults with suicide risk, to help develop coping and problem-solving skills.”



Jeffrey SooHoo, MD, MBA

Jeffrey SooHoo, MD, MBA associate professor of ophthalmology and assistant dean of admissions, discussed the School of Medicine’s process for reviewing medical student applicants in the wake of a U.S. Supreme Court’s decision restricting consideration of applicants’ race. “We’ve never assigned points or any specific advantage per se, to those attributes,” he told *Colorado Public Radio* in August. “Rather, we’ve used someone’s background to contextualize what their opportunities have been . . . Recognizing that applicants that are underrepresented in medicine have some historical disadvantages that maybe have played out in their education or in their opportunities for research, volunteer work, leadership, things like that.”

Jennifer L. Taylor-Cousar, MD, MSCS, professor of medicine, made a presentation on disparities in diagnosing cystic fibrosis at the American Thoracic Society International Conference that was quoted in June by *Healio*. “Racism does occur in medicine,” she said. “Even though race and ethnicity are social constructs, because of racism, which impact the social determinants of health, we therefore see the effects in medicine.”



Maryam Asgari, MD, MPH

Maryam Asgari, MD, MPH, chair and professor of dermatology, was quoted by the Denver CBS affiliate in July for a report about the risk of skin cancer, including basal cell carcinoma or squamous cell carcinoma. “For us in Colorado, the latest figures are that about 100,000, 21.9 get diagnosed with a skin cancer every year,” she said. “Nationally that number is 19.7 and I know that doesn’t sound like a very big difference, but it actually is and puts us in the highest per capita rate.”

David Howell, PhD, associate professor of orthopedics, explained research on recovering from concussions in an August report on the Denver CBS affiliate. “There’s been a lot of research, a lot of which we’ve helped produce here at Children’s Hospital Colorado that essentially shows that early physical activity is not harmful for athletes who get a concussion, and in most cases can actually be beneficial,” he said. “Complete rest where you have somebody sit in a dark room is actually in some cases perhaps detrimental, certainly not helpful to somebody recovering from a concussion after about a one-to-two-day rest period.”

Daniel Bessesen, MD, professor of medicine, was quoted in June in an Associated Press report about studies that considered whether people would prefer a high-dose oral version of a weight-loss drug rather than injections. “If you ask people a random question, ‘Would you rather take a pill or an injection?’ People overwhelmingly prefer a pill,” he said.

Melanie Cree-Green, MD, PhD, associate professor of pediatrics, discussed with NBC News her clinical trial of semaglutide for young women who have polycystic ovary syndrome



Melanie Cree-Green, MD, PhD

and obesity. “When it works, it works,” she said in the June report. Cree-Green remembered one of her patients’ mothers crying during an appointment late last year. “She said, ‘You’ve given me my daughter back,’ and then everybody in the room was crying,” Cree-Green said. “These medications are life-changing.”

Richard Johnson, MD, professor of medicine, explained in an August article in Newsweek how fructose can lead to weight gain. “Fructose turns out to have a very powerful way to activate a biological switch that activates a range of processes that includes hunger, eating, leptin resistance—the satiety hormone—and a series of events that make you want to store fat,” he said. “And we actually showed that it’s unique to fructose. And that it works by tricking the cells into thinking it doesn’t have enough energy.”

Ben Honigman, MD, professor emeritus of emergency medicine, in July discussed with Denver-based Fox31 the causes of high-altitude pulmonary edema after a hiker died on a trail at Rocky Mountain National Park. “High altitude pulmonary edema develops over a two, three-day period of time typically,” Honigman said. “The low oxygen levels cause changes in the lungs to where there’s leakage of fluid that moves from the blood vessels into the airspaces and causes fluid accumulation.”

Sean O’Leary, MD, MPH, professor of pediatrics, discussed Beyfortus, a shot to protect healthy babies from the respiratory ailment RSV, with the Washington Post in July. He said logistical, educational, and financial hurdles could delay the drug’s rollout before the winter respiratory season. “It’s hard to predict,” O’Leary said. “I’d love it if we could get high uptake in

the first season, because it would prevent a lot of hospitalizations, but I’m not all that hopeful.”

Kyle Leggott, MD, assistant professor of family medicine, discussed with the Denver Post his work with Project ECHO (Extension for Community Healthcare Outcomes) to provide training for primary care providers who see long COVID patients. “So much of what we do (in primary care) is chronic disease management, and long COVID seems to be moving into the category of chronic disease,” he said in June.

James Jagers, MD, professor of surgery, was featured in an August report on Denver-based Fox31 about performing a rare life-saving surgery on a Montana baby at Children’s Hospital Colorado. “It’s really pretty rare to be able to do a two-ventricle repair in somebody with this kind of anatomy,” he said.

Mandy Allison, MD, associate professor of pediatrics, told CNN in August that corporal punishment in schools is ineffective. “This isn’t acceptable — all children need to feel safe to learn,” she said. “While a child or teen might become fearful, obedient and quote ‘get in line,’ that’s only in the short term after being struck. Research shows corporal punishment does not improve behavior over the long term, is not an effective means of discipline, and does not foster a positive learning environment and supportive school climate.”

Connie Savor Price, MD, MBA, professor of medicine and chief medical officer at Denver Health, was quoted by VeryWell Health in August about over-the-counter rapid tests for COVID. “I don’t know how good these tests are yet against some of the newer subvariants that we’re seeing emerging,” she said, adding that symptomatic people with negative tests may still consider staying home. “You don’t want to spread any virus to another person unnecessarily.”

Steve Berkowitz, MD, professor of psychiatry, told ABC News in August that natural disasters, such as the wildfires in Hawaii, can cause people to develop post-traumatic stress disorder. “People who develop any of these issues are at very high risk for suicide,” he said. “People with PTSD or any of these trauma-related disorders will often be more irritable, have angry outbursts and that can lead to physical aggression and issues. Substance dependence is not an uncommon outcome of this.”

EXTENDED REACH

CU Orthopedics adds expert in treating above-the-elbow amputations

Interviewed by Greg Glasgow

Eric J. Earley, PhD, a new faculty member in the Department of Orthopedics, is bringing his expertise in prosthetic limbs to the department's Osseointegration Research Consortium. Led by Jason Stoneback, MD, the lab is focused on developing and improving bone-anchored limb technology aimed at creating prosthetic limbs that can be directly inserted into bones, as opposed to the traditional prosthetic that attaches via a socket that goes around the outside of the limb.

Prior to joining CU, Earley, now an assistant research professor of orthopedics, was a postdoctoral researcher at the Center for Bionics and Pain Research at Chalmers University of Technology in Sweden, where he helped create a new method of using sensors and a skeletal implant to allow people with amputations above the elbow achieve an unprecedented level of control over the individual fingers on a bionic hand.

The team published a paper in July in the journal *Science Translational Medicine* detailing their experience with one patient in Sweden, a case in which the researchers found that by splitting the nerves severed by the amputation and rerouting them to the muscles that remain in the limb, they could increase the number of recognizable control signals from the patient to the bionic hand.

We spoke with Earley about the research and its impact.

What was the problem you were looking to address with this research?

One of the major challenges of amputation is that the farther away from the wrist the amputation happens, the more functions are lost. At the same time, there are fewer signals to try to replace them. As you move from below elbow to above elbow, it becomes extremely difficult to try to replace all those distal functions. The only thing we can really predict is flexion extension of the biceps because all the finger muscles are below the elbow.

What was the technique you helped develop to address the problem?

We call it a neuromusculoskeletal prosthesis. We started with the osseointegration technology, the bone-anchored implant, then Dr. Max Ortiz-Catalan, the director of our lab, added implantable sensors that go into the muscles and the nerves. Those components allow us to address many of the limitations of prosthetic limbs. The bone anchoring allows for a better range of motion. The implantable sensors allow us to read electrical signals from the muscles whenever they contract, which we can use to predict what someone's intent is. When someone has an amputation, the muscles are still there; they're just



Eric J. Earley, PhD

no longer connected to the joints that they used to act upon. But those muscles can still contract. Typically, someone with an amputation above the elbow will flex their biceps or their triceps, we read those electrical signals, and we use that to determine whether someone is, for example, trying to open or close a hand.

How were you able to use the remaining nerves in the upper part of the arm to help the patient gain better control of the bionic hand?

The nerves that used to go down to the finger muscles are still up in the upper arm, but those nerves are no longer connected to anything. Dr. Paolo Sassu, our team's hand surgeon, split the nerve up into multiple fibers, and in some instances, he would grow that fiber directly into a muscle that was still there but not activated on anything. This is a technique we call targeted muscle reinnervation. The crux of this surgery is that nerves are dumb. You can plug them into any muscle, and whenever the nerve receives a brain signal to do some function, that muscle is going to contract.

In this case, we took some functionality that was related to the pronation and supination of the wrist, or maybe the thumb or a couple of fingers. When our patients would try to perform those movements, that muscle would contract, which meant we can read that electrical signal and use that to control a hand.

“The most exciting part is the functionality this patient has gained from being involved in the study.”

How did muscle grafts play a part in the research?

There's a surgery we use to create that we call a regenerative peripheral nerve interface, or RPNI. It's a little bit like a bacon-wrapped date. You take a nerve, and you take a muscle graft, either from somewhere else in the body or a donor graft, and you wrap that muscle around the end of the nerve. Whenever that muscle fiber fires, that tiny muscle graft will contract. If you put an electrode inside of that muscle, you can read the same electrical signals. For somebody with an amputation above the elbow, we can use that, so they are able to control a prosthetic hand and move each of the fingers individually. That normally would not be biologically possible, because all those muscles exist below the elbow. But through the surgical reconstruction, we're able to bring those back.

What technology did you use to translate the signals from the muscles into movement in the bionic hand?

After the surgery is done, we ask our participant to try to flex his thumb, his index finger, and his middle finger, and we record all the electrical signals from these muscles and nerve grafts. We take all that data and feed it into a machine-learning algorithm, and the machine-learning algorithm will pick out, “OK, this is what the electrical signals look like when he's trying to flex the index finger. This is what the electrical signals look like when he's trying to

extend the index finger.” We teach the computer to recognize these electrical signals, but once it's able to do that, we can have the patient connected to his prosthesis, and whenever he creates these electrical signals, it will handle the movement.

Is the idea that eventually everyone with a new amputation would get this? Or is this something that would be a second step after you've had had the traditional socket prosthetic?

It's hard to say right now. It's still under investigation in the U.S. There are regulations we would need to go through. Also, it's not a perfect fit for everybody. There are weight limitations and bone strength limitations that need to be met.

Here at the CU School of Medicine, our approach is that we want people to start with a traditional socket prosthesis, and if they don't have any problems with that, then we leave it alone. But if they're running into problems with that, then we can start discussing whether osseointegration is the right choice for them. As far as the implanted sensors, I think that in a perfect world, every trauma surgeon would know how to do these nerve transfers and how to identify what muscles are most useful and what functions are most useful for a prosthetic hand and can do those at the time of amputation. That way, when the prosthetists and occupational therapists and engineers come along later, the patient is already set up to have the best outcome.

What was the most exciting part of this research for you?

The most exciting part is the functionality this patient has gained from being involved in the study. After receiving the bone-anchored limb and the implanted sensors, he drastically and very quickly improved his functionality and his independence. He participated in a competition called the Cybathlon, which is like the cyborg Olympics. He participated in a couple of races to perform daily tasks, things like tying your shoes and cutting bread and opening jars and hanging up clothes and changing light bulbs. The competition was a huge motivating factor for him.

Do you plan to continue this research at the CU School of Medicine?

Right now, there are no plans to use this particular technology, but I'm interested in leading the lab to doing more of this neural interfacing. I'm no longer formally affiliated with the Swedish lab, so my focus going forward is really on bringing a lot of that expertise in technology and trying to implement that here at CU to turn this campus into a global center for prosthetics, technology, and rehab.

HOW AI IS CHANGING HEALTH CARE

CU faculty address the challenges and benefits of artificial intelligence

By Kara Mason

In nearly every corner of the University of Colorado Anschutz Medical Campus – in clinics, in classrooms, in offices, and in laboratories – faculty members and students are thinking about the power artificial intelligence, or AI, holds in health care, from finding treatments for rare diseases to developing machine learning standards to helping ophthalmologists assess patients

On a Wednesday morning in August, the waiting room of the Sue Anschutz-Rodgers Eye Center is half-full by 8 a.m. As patients are called into clinic rooms where physicians take photos of the eyes, AI is already in play.

“Ophthalmology patients may currently encounter AI in their care through AI-assisted diagnostic tools, such as automated retinal image analysis for early disease detection,” explains Malik Kahook, MD, professor of ophthalmology and the Slater Family Endowed Chair in Ophthalmology at the University of Colorado School of Medicine. “This technology is evolving rapidly as new algorithms and approaches are being developed and integrated into clinical practice.”

It’s a common theme in nearly all aspects of medicine. These are a few ways faculty members in the CU School of Medicine use, study, and think about AI’s future in their work and in patient care.

IMPROVING CARE

When Kahook, a prolific inventor, is designing and building physical devices to be used in the operating room or in the clinic, he’s also thinking about what AI can offer to the process. Earlier this year, when Kahook asked ChatGPT about unmet needs in ophthalmology, the language processing tool replied: “We currently lack pharmaceutical methods for treating ocular diseases with precision and efficacy, where



Malik Kahook, MD

drugs are delivered directly to the targeted tissues, and where patients experience fewer side effects without compromises.” That AI-born response became the beginning of a presentation Kahook gave in February, when he unveiled promising results for SpyGlass, a device he invented that can be injected directly into the eye to deliver glaucoma medication for up to three years.

While AI’s use as a tool to improve patient care evolves, a major question is how it compares to the physicians who are experts in identifying and treating disease. Kahook says he believes the technology could help make a diagnosis more objective. Still, challenges do exist.

“The pros of using AI to achieve a diagnosis include reducing variability among clinicians, potentially leading to more consistent and accurate diagnoses,” he says. “It can also augment clinicians’ expertise and speed up the diagnostic process. However, the cons involve potential over-reliance on AI, overlooking subtle nuances that experienced clinicians might notice, and ethical concerns regarding AI’s role in decision-making.”

“AI can assist in more accurate diagnostics, personalized treatment plans, and efficient administrative tasks, ultimately improving patient care and outcomes.”

Like many, Kahook sees AI as another tool to improve medicine and patient care.

“The fact that this technology is rapidly evolving means that the clinical setting can benefit from increasingly advanced tools that augment current capabilities,” he says. “AI can assist in more accurate diagnostics, personalized treatment plans, and efficient administrative tasks, ultimately improving patient care and outcomes.”

There’s also the possibility for AI to help uncover disease at an earlier point of development, ultimately giving doctors more time to slow progression, address symptoms, and bolster research avenues toward enhancing the preservation of vision.

“For physicians, this would mean the ability to diagnose and treat patients at an earlier stage, leading to better outcomes and quality of life,” Kahook says. “Additionally, such early detection could accelerate research efforts by providing large datasets for studying disease progression and treatment responses.”

MACHINE LEARNING

The continual addition of large datasets and the application of the resulting analysis – a process known as machine learning – can be used to enhance the power of physicians and health care professionals. Machine learning ranges from relatively simple implementation, such as using closed captioning on a video call with a patient, to the complex, like discovering new personalized medicine treatments for rare diseases.



Casey Greene, PhD

Casey Greene, PhD, founding chair of the Department of Biomedical Informatics (DBMI), offers a simple definition of what machine learning does: “A computer program’s encounter with the data changes the model.” But how faculty apply this type of AI is anything but simple.

Assistant professor Milton Pivadori, PhD, developed cluster match, a machine learning method that can identify non-linear correlations between two variables, such as sex-specific effects, much more quickly

than existing methods, allowing him to delve into previously out of reach genome-wide datasets, while Fan Zhang, PhD, assistant professor of medicine with a secondary appointment in the department, uses machine learning to identify new target treatments for rheumatoid arthritis, which currently has no cure or widely successful therapeutic options.

In the last decade, machine learning has evolved and developed significantly. In 2014, computer scientists joked that it would take hours for a computer to identify a bird in a photo. Now, an app on your phone can monitor a birdfeeder in real-time, notifying you when a bird arrives and telling you what type it is.

A confluence of two forces in information technology contributed to the rapid improvement of machine learning, Greene says. First, a focus on gathering data raised the possibility of training larger models than ever before, and specialized computer hardware, largely based on graphics processing units like those used for video games, made processing that data feasible.

“We discovered that the types of neural networks that worked well on the problems we were working with had been developed for quite some time, but didn’t have a natural match in the computing sphere so that we could build them quickly and larger than what had been built before. We also needed to be able to train them over larger amounts of data.”

The next frontier of machine learning in health care, Greene says, is multimodal integration, a system that can take text and generate an image or text. Systems for art and language, such as DALL-E and ChatGPT, have already been making waves. The next few years may bring more multimodal integration, where images, video, text, and other data are generated together to form a new kind of reality, which may have many biomedical applications.

For health care, Greene says he’d like to see a focus on accuracy of machine learning. That will likely require hybridizing AI methods from a few decades ago, which were heavily focused on reasoning, with machine learning methods that are now prominent, he says.

There is also a need for health care professionals who understand AI. Greene notes that the need for data scientists who understand health care systems, electronic health records, medicine, and biology continues to grow.

“In health care, our data, processes, and the needs of our patients and providers are unique, so there’s a critical need for more scientists trained in these techniques,” he says.

ADDRESSING BIAS

As AI technology rapidly evolves, so do questions from health care ethicists, like Matthew DeCamp, MD, PhD, associate professor of internal medicine at the CU Center for Bioethics and Humanities, who has spent the last several years studying bias in health care AI.

DeCamp says he had an “ah-ha” moment in 2019. After reading a book about the applications around AI and health care, he began noticing changes in his own primary care clinic.

“I remember thinking that these scenarios aren’t theoretical anymore. They’re actually happening,” he says. “In fact, there were technologies already being developed at that time and you could see the writing on the wall that there were going to be more AI-based tools coming into the clinic.”



Matthew DeCamp, MD, PhD

One of those tools, chatbots, have been a main focus for DeCamp, who, along with other CU School of Medicine researchers, in June published a paper in the *Annals of Internal Medicine* that challenges researchers and health care professionals to closely examine chatbots through a health equity lens and investigate whether the technology improves all patients’ outcomes equally. The look of a chatbot, for example, can raise new questions of bias.

“Some health systems created chatbots as symptom-checkers,” DeCamp explains.

“You can go online and type in symptoms such as cough and fever and it would tell you what to do. As a result, we became interested in the ethics around the broader use of this technology.”

Physicians’ own opinions about AI can also have a role in its effectiveness – another topic of interest for DeCamp. Who a patient’s doctor is could really matter. In an article published in the journal *Science* in July, DeCamp and a co-author write: “Although not specific to AI, in some prior studies, older physicians are less likely to follow algorithm-based recommendations, whereas in other studies, younger physicians override decision support more.”

“A key for medicine and science in general is that we can’t have a top-down approach. We’ve got to create these tools together.”

“We see a lot of attention given to developing fair algorithms and fair datasets,” DeCamp says. “While that’s important, things can change when algorithms enter a clinical environment where there are new and different forms of bias, such as overly skeptical clinicians.”

Ultimately, DeCamp says, it’s not up to one sector of the health care industry to solve the bias that arises in AI tools. There are questions that everyone should consider.

“We have to ask ourselves, ‘Who are we forgetting? Who is left out by these tools?’ There’s a place in ethics that puts special emphasis on the way we treat those who are or who may be in the minority and are harmed by what we’re doing,” he says. “It’s important to not assume that just because something is better overall it’s better for everyone. There may still be individuals and groups who are harmed by the technology.”

Addressing those challenges should come in the design process of new tools.

“We need to start demanding that AI proactively reduce disparities and equities, not design it and wait for that to happen later,” DeCamp says.

TEACHING AI

Most physicians and researchers can agree that AI isn’t going away, and as the technology becomes more integrated into research and patient care, medical educators are thinking about how to introduce ever-evolving AI into the classroom and what guidelines to set around it. Shanta Zimmer, MD, senior associate dean of education at the CU School of Medicine and professor of medicine in the Division of Infectious Diseases, says it is important to understand the limits of AI and to develop the critical thinking skills. Students need to know when to pull back from the technology and make decisions on their own – whether that is studying for a quiz or meeting with a patient.

Earlier this year, Zimmer wanted to know whether ChatGPT could be helpful in a medical education setting, so she sat down at a computer and conducted her own experiment.

“I opened ChatGPT — I’d never tried it before — and I said, ‘Give me an outline of the competencies for artificial intelligence and machine learning and medical education,’” Zimmer says. “I went to get a cup of coffee and came back a few minutes later to this beautiful outline.”

Zimmer compared the outline to a scholarly paper written by educators. She was impressed. “There were a lot of similarities,” she says. “It was done quickly, and I thought, ‘Well, that’s really very cool. I wonder if

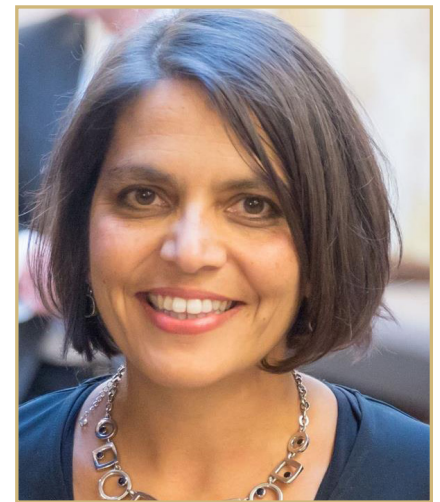
we should be doing that more as we’re developing guidelines for AI.”

Zimmer, like others throughout the field of medicine, has some skepticism about the ability of AI to diagnose patients and return accurate results, but she says it’s worth introducing to students early, so they can also continue to grow and evolve along with the technology.

“We are thinking about ways to develop some assignments where students use artificial intelligence and then critique it, because we want them to understand that there may be things that are wrong,” Zimmer says. “A key for medicine and science in general is that we can’t have a top-down approach. We’ve got to create these tools together.”

This approach has led to discussions with students, who are already using AI programs for studying. Zimmer points out that there are many discussions about transparency, including how to cite the use of AI features like ChatGPT, just as one would with a book or journal article.

“There’s general concern and thoughts that maybe it shouldn’t be part of the curriculum, but I think that students will have to use these tools in the future, so rather than shutting things down, we should embrace it and develop some guidelines around how to use it,” she says.



Shanta Zimmer, MD

BIG LEAGUE CARE

From cancer treatment to running the bases

By Kara Mason

This summer, six-year-old Coleman Tawresey will go more than 12 consecutive weeks without a doctor's appointment – something he hasn't been able to do since being diagnosed with retinoblastoma when he was two.

It's a welcome break for the kindergarten graduate and his family who now have more time to play, ride bikes, and enjoy the Seattle Mariners, who invited Coleman to hang out with the baseball team and run the bases at their season opener this year after Coleman beat his cancer for a third time.

"We're feeling pretty good about remission," says Coleman's mom, Laurel Tawresey.

Scott Oliver, MD, associate professor of ophthalmology who directs the eye cancer program and is the chief of retina services at the Sue Anschutz-Rodgers Eye Center, treated Coleman for more than two years. He says Coleman's experience is one of perseverance.

Retinoblastoma, an eye cancer that forms in the retina and most often occurs in young children, can result in blindness, loss of the eye, and even death. Coleman was ultimately diagnosed with tumors in both of his eyes, making the cancer even more challenging to treat. While he has reduced vision in one eye, his other eye sees perfectly, and he functions like any other kid.

Coleman underwent several rounds of chemotherapy, including intra-arterial chemotherapy, which targets drugs directly at the tumor by threading a catheter through the femoral artery, past the heart and carotid artery, and into the artery that feeds the eye. Coleman also received radiation plaque therapy, laser topical therapy to eliminate cancerous seeds in the eye, and intravitreal injections.

PARENTS' INTUITION

In 2020, Coleman, then two years old, was hitting his developmental milestones, Laurel says. There wasn't any obvious indication he didn't have much vision in his right eye. It wasn't until an ear tube surgery and a follow-up screening that Coleman's family started to suspect something was wrong with his vision.

One evening shortly after Coleman had failed the vision test and the family was awaiting a check-up appointment with a pediatrician, Laurel and her husband were playing with Coleman and noticed one of his pupils looked white.

"I remember thinking that is not normal," Laurel recalls. "At that point we did what everyone does and Googled it. We found that you can take a picture with a flash, and it can show signs of retinoblastoma, so we got our camera and took a picture."

The next day Coleman was in an ophthalmologist's office.

Laurel says it wasn't obvious that anything was affecting her toddler's vision.

"He could drop kick a soccer ball, run, and climb, and do all of these things normally, so there wasn't any indication to us that he didn't have much vision in that eye," Laurel explains.

REACHING REMISSION

"There are a lot of treatment options for retinoblastoma," Oliver explains. "But there still isn't a slam dunk treatment. It's a disease that 96 to 98% of children in the U.S. survive, so it really becomes primarily about trying to save the eye and vision."

While many treatments for various types of cancer are moving toward targeted therapies — which can single out a specific gene or protein — all the chemo therapies used to treat retinoblastoma are non-specific.

On average, Oliver says it takes about a year to resolve retinoblastoma, but for Coleman it took more than two years. All the while, the boy was catching baseballs and riding his scooter, Laurel says. That gave her and Coleman's family hope that Oliver wouldn't have to remove an eye or that Coleman would lose vision.

"We have special tools to give patients a shot at keeping their eye," Oliver says. "It's a lot of work, and you have to be in it for the long haul."

Now, Coleman is in remission for the third time and his prognosis is looking good.

To celebrate, the Make-A-Wish organization helped Coleman spend Opening Day at T-Mobile Park in Seattle, where he and his family now live.

Laurel says Coleman has remained a fun-loving kid.

"One thing that inspires me about my son is that in spite of it all, he still is a very kind and caring and goofy kid," she says. "In the face of medical trauma, it wouldn't be unreasonable or even uncommon for a kid to struggle with behavioral issues, aggression, anger, or extreme sadness. But he's such a sweet boy."



Coleman Tawresey runs the bases before this year's season opener at T-Mobile Park in Seattle. The Mariners invited Coleman to hang out with the team after beating retinoblastoma. Photo courtesy of the Seattle Mariners.

DEEP BREATHS

Austin Yang makes travel plans after lung transplant surgery

By Todd Neff

Successful surgery gives most lung transplant patients a chance to really breathe again.

It gave Austin Yang his first taste of really breathing. At least as far as he could remember.

Yang fell ill with pneumonia from an adenovirus when he was a baby. It led to a rare disease called bronchiolitis obliterans. You don't need to know Latin to get the gist: It damaged his lungs and hindered their development.

The son of Hmong refugees from Laos, Yang, now 26, spent most of his life on supplemental oxygen delivered through a tracheostomy tube. An oxygen tank accompanied him through high school in Northglenn and college at the University of Colorado Denver. A ventilator met his oxygen needs as he slept.

Not long after he graduated with an information systems degree in May 2022, Yang's health deteriorated. By that September, his lungs were failing. He was admitted to Children's Hospital Colorado, where he had been treated for years and was soon on a mechanical ventilator 24/7.

WAITING FOR SURGERY

In October, as a wave of RSV cases swamped that hospital, he was transferred across the Anschutz Medical Campus to UHealth University of Colorado Hospital (UCH). He needed a lung transplant, and UCH is where those happen in Colorado. The hospital's transplant services team has performed every lung transplant in the state since 1998, including 40 in 2022.

Alice Gray, MD, a University of Colorado School of Medicine critical care medicine specialist and medical director of Lung Transplantation at UCH, quickly recognized that Yang's lungs were too far gone for even a ventilator. She put him on an ECMO, machine that takes blood from the body, adds oxygen, removes carbon dioxide, and pumps it back in.

"ECMO is very sci-fi," Yang said later. "But after a while, it was just like, 'Oh, it's just another oxygen tank, you know – something I'm used to.'"

Gray also put Yang on the waiting list for a lung transplant. Given Yang's youth and other factors, his wait might normally have been about a week. But Yang stood four-foot-eleven and weighed around 90 pounds. That limited his options. His days in UCH's cardiothoracic ICU stretched to two weeks, then three, then four.

At that point, Gray said, "his blood pressure was low, and we were worried he was soon going to become too sick to survive a transplant."



Austin Yang's lungs were damaged by bronchiolitis obliterans when he was a baby. In 2022, lung transplant surgery at UHealth University of Colorado Hospital gave him his first taste of breathing on his own. Photo by Cyrus McCrimmon.

REPLACING 'DESTROYED' LUNGS

Finally, after more than a month, a lung match came through. The morning of Dec. 9, 2022, Yang was rolled into a UCH operating room, where CU School of Medicine cardiothoracic surgeon John Mitchell would perform a double lung transplant.

When he met Yang prior to surgery, Mitchell said, "I was very impressed at how he seemed to be dealing with the incredibly difficult situation he was in – just a tremendous amount of fortitude through the whole thing."

Early in the procedure, Mitchell saw that this would be one of the most challenging of the hundreds of lung transplants he had performed. Not only were Yang's lungs "basically destroyed," but also previous pleurodesis procedures to stop the lungs from collapsing had brought scarring that essentially cemented Yang's lungs to his chest walls.

"So, chiseling out everything safely for him was really difficult," Mitchell said.



Austin Yang on the treadmill in UCHealth University of Colorado Hospital's pulmonary rehabilitation center two-and-a-half months after surgery. Before the transplant, he could barely walk without supplemental oxygen. Photo by Cyrus McCrimmon.

Twelve hours later, Mitchell and the surgical team had finished their work. Yang returned to the cardiothoracic ICU for a couple of days, underwent a routine follow-up procedure to remove blood clots, and was home two weeks later. The tracheostomy tube, the oxygen tank by day and the ventilator by night – all were now things of the past for him. In their place were antirejection drugs.

He was doing pulmonary rehabilitation at UCH within two months of surgery – on the treadmill and other cardio machines as well as doing strength work, all of it unimaginable before.

“I have so much more energy,” Yang said.



John Mitchell, MD, professor of surgery and chief of general thoracic surgery, said Yang's surgery was one of the most challenging of the hundreds of lung transplants he has performed.

PLANNING TO TRAVEL LIGHTLY

He looks forward to job hunting, perhaps in cybersecurity, ideally in IT at Children's Hospital Colorado.

“I've been there so long that I want to repay their kindness,” he said.

He also looks forward to traveling to places like Japan, South Korea, Taiwan, and Canada. Before, even if he had the energy, he would have to lug oxygen, a ventilator, and sterilized water for the ventilator's humidifier. Now, he can travel light, he says.

“Now, it's just packing clothes, a few medications, that's it,” Yang said.

He concedes that the prospect of undergoing a transplant was “a scary thing.” But it was, at the same time “a very joyful thing, bringing about a new life, if at the cost of an unfortunate passing of someone else,” he said.

Mitchell may have performed the essential act of replacing Yang's failing lungs with healthy ones, but he stressed the importance of the team's broader efforts. Gray's care kept Yang strong enough to withstand the transplant. Critical care doctors and nurses sustained Yang for weeks in the ICU. Anesthesiologists managed him during the operation. Perfusionists kept an eye on Yang's ECMO.

“It's a big group effort – that's so important,” Mitchell said.

There are no guarantees for lung transplant patients. There's a 45% rejection rate in the five years post-transplant. But Mitchell is optimistic.

“If you look at his X-rays, it's just unbelievable. I think overall, he's off to a really good start, especially given what dire straits he was in prior to the operation,” Mitchell said. “It's really gratifying.”

This article was originally published by UCHealth in March 2023.

COMPREHENSIVE CARE

Karla Ojeda's medical journey through cancer care and transplant surgeries

By Tyler Smith

Astrophysicist Neil deGrasse Tyson once said, “The universe is under no obligation to make sense to you.” While he aimed the comment at those resistant to seeking answers in science, his message applies equally well to those whose lives are struck by seemingly random cruelty.

It is in that latter way that his words echo for Karla Ojeda.

Ojeda is a 45-year-old wife, mother of three teenagers she calls her “driving force,” and the proud daughter of strong immigrant parents. Her longtime job as Human Services Community Resources coordinator with Adams County satisfies her passion for helping people.

Yet life has also mysteriously battered the strong moorings of Ojeda's life. A genetic mutation saddled her with polycystic kidney disease (PKD), an incurable condition that brought her kidneys to the brink of failure.

Cysts also ravaged her liver, and Ojeda urgently required a transplant. While waiting for a donor liver, Ojeda was diagnosed with breast cancer. The assault left her wondering why such misfortune had been heaped upon her.

“I've always believed that things happen for a reason,” Ojeda says. “Sometimes you know why and sometimes you don't. Going through my medical journey, a lot of times, I didn't understand why things would happen, and I would get frustrated.”



Karla Ojeda

Ojeda is still waiting for those answers. But through her own will and determination and skilled medical care at UCHealth University of Colorado Hospital (UCH), she has fought through the array of challenges and looks forward to a life free from the shackles of disease.

LIVING WITH KIDNEY DISEASE

The major thread of Ojeda's health ordeal is PKD, a genetic condition that riddles the kidneys with fluid-filled cysts. Over time, the cysts grow and take over

space from healthy tissue, greatly increasing the risk of kidney failure. Ojeda learned she had PKD during high school after a long, unexplained

illness. At that point, she wasn't fazed by the diagnosis.

“I thought I was invincible,” Ojeda said.

She learned to control her blood pressure, limit her salt intake, drink plenty of water, and exercise. She was particularly cautious during her three pregnancies. Her kidney function continued to worsen, but in 2018 she got some help from tolvaptan, the first FDA-approved drug to treat PKD. The drug blocks the hormone vasopressin, which prevents an individual from urinating constantly, explained Charles Edelstein, MD, PhD, a kidney disease specialist who treats Ojeda in the UCHealth Polycystic Kidney Disease Clinic – Anschutz Medical Campus.

“Vasopressin causes the cells lining the cysts in the kidneys to proliferate and the cysts to grow,” said Edelstein, who is a professor of medicine at CU School of Medicine. By blocking vasopressin, tolvaptan forces an individual to urinate frequently, thus slowing – but not stopping – cyst growth, he added.

UNUSUAL LIVER PROBLEM

A more immediate problem for Ojeda, Edelstein added, was her polycystic liver disease (PLD), which frequently accompanies PKD.

“Most patients have both [PKD and PLD],” Edelstein said. “Normally, the kidneys get big and cystic and fail, and the liver doesn't present a problem. For Karla, the case was the other way around. She needed a liver transplant before a kidney transplant, which is extremely unusual.”

The cysts in Ojeda's liver ballooned from a normal size of 2 pounds to 11. The organ wasn't failing, Edelstein said, but taking up so much space in the abdomen that other organs, like the intestines, couldn't function normally.

“I was very fatigued. Eating was hard,” said Ojeda. “I could feel the pressure in my abdomen, much like when I was pregnant.”

BREAST CANCER DIAGNOSIS

Ojeda was on the list for a liver transplant when she absorbed another unexpected blow. During a routine pre-transplant exam in May 2018, she received a mammogram that revealed she had breast cancer. The shocking diagnosis was magnified by the necessity to put the liver transplant on hold. It was a setback, but Ojeda said the breast cancer and transplant teams at UCH worked together to restore her health and

keep the search for an organ donor on track.

After a lumpectomy to remove the cancerous tumor, Ojeda underwent eight rounds of weekly radiation treatments. Five years later, she is cancer-free.

“I never felt hopeless at all,” she said. She acknowledges, however, the period of treatment and waiting for a liver took both a physical and emotional toll.

“There was a lot I had to give up,” Ojeda said. “I couldn’t always go to my kids’ activities or be in public because of my fatigue and side effects from the radiation.”

She considered taking time off from work but decided against it.

“I felt that work was the only thing that remained normal,” she said, crediting her employer for giving her accommodations through the difficult time.

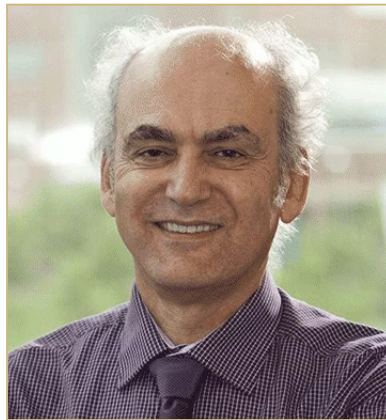
“Work helped to keep me grounded,” Ojeda said. “It was one of the few things I had a little bit of control over.”

She also turned back her life-threatening liver disease in January 2019, when UCHhealth transplant specialist James Pomposelli, MD, PhD, professor of surgery, transplanted her new liver successfully.

“In about six to eight weeks, I felt better, and now it feels fantastic,” Ojeda said.

KIDNEY DISEASE TAKES A TOLL

Throughout her struggles with PLD and breast cancer, however, her cyst-ridden kidneys continued to deteriorate. They grew from the normal size of a fist to the girth of a football, and their function decreased. Ojeda felt more fatigued, and her blood pressure increased, along with bouts of headaches and lightheadedness.



Charles Edelstein, MD, PhD, is professor of medicine at CU School of Medicine and the kidney specialist who treats Karla Ojeda in the UCHhealth Polycystic Kidney Disease Clinic – Anschutz Medical Campus.

“I had very little appetite, and I was exhausted after eight hours of sleep,” she said. While the tolvaptan helped to slow the progression of her PKD, she also had to get up frequently to urinate, which contributed to her exhaustion.

Edelstein eventually warned her that she would soon need dialysis to support her failing kidneys. Ojeda asked for a bit more time to see if the transplant team could find a donor. A living donor was not a match, but a paired donation – which involves swapping living donor kidneys with compatible recipients – provided a solution. Thomas Pshak, MD, associate professor of surgery, successfully performed Ojeda’s kidney transplant in March 2022.

“The kidney works beautifully,” Ojeda said. She estimated that she is back to 90% of how she was before the “emotional rollercoaster” of health problems.

Her success story has many supports. The Polycystic Kidney Disease Clinic, staffed by Edelstein, fellow kidney disease specialist Michel Chonchol, MD, professor of medicine, and nurse Amy Wilbur, is a PKD Foundation Center of Excellence based on its expertise, integrated care, research, and network of providers. A direct benefit of that status for Karla Ojeda and other PKD patients: the PKD Clinic is housed on the same floor as the Transplant Clinic, and the providers in each work closely together. Edelstein and Pshak manage Ojeda’s kidney care, while Pomposelli and liver transplant specialist James Burton, MD, professor of medicine, coordinate her liver care.



Thomas Pshak, MD

Edelstein also noted that the University of Colorado School of Medicine has a long history of expertise and leadership in PKD clinical care and research. It began with Patricia Gabow, MD, professor emerita of medicine, in the 1970s and continued with the late Robert Schrier, MD, who brought the school’s Division of Renal Diseases and Hypertension to national prominence during two decades of leadership.

“When you are struggling and going through it, it’s hard to see the light at the end of the tunnel. But as long as you believe in yourself and have a good support system and people who love you, you can make it through just about anything in life.”

“It’s led to many patients coming to our clinic from out of state,” Edelstein. The reach stretches across the Rocky Mountain region and as far away as Alaska, he added.

WELL-ROUNDED CARE

Ojeda said she appreciated the “well-rounded care” that UCHHealth offered. For example, she faced mental health challenges after the transplants, partly because of a loss of self-esteem she attributes to weight gain caused by the prednisone she takes as a post-transplant immunosuppressant. She also suffered feelings of guilt for putting her family through her ordeal. Ojeda said Melissa Kitowski, PhD, with the CU Department of Psychiatry, helped her deal constructively with these painful thoughts.



Karla Ojeda (second from right) had a kidney transplant that gave her a new lease on life. She is photographed with her children, Jordyn, Jade, and Carlos Jr. Photo courtesy of Karla Ojeda.

“I’m working back, and things are falling into place,” Ojeda said.

She credits her husband for helping her to maintain her strength and resolve during difficult times, but she has a fortress of support. For example, her parents, immigrants from Chile, instilled a strong ethic of personal growth and commitment, she said.

“My parents emphasized the importance of getting a good education and working hard to go far in life and be able to enjoy it,” Ojeda said. She added that her dad prodded her to stay positive as she battled through her cancer treatments and transplant surgeries.

An extended group of people, including her sisters-in-law, whom she calls “my pillars,” also assisted Ojeda through hard times, helping her husband, watching the kids, and keeping her company.

Most of all, the three kids, Jade, Carlos, and Jordyn, pushed her to battle back.

“I kept telling myself that I have to keep going,” she said. “I want to see them grow up, graduate from high school, and do whatever they want to do with their lives. I always kept that in the back of my head.”

The long periods of missing their activities are behind Ojeda. She experienced the “incredible joy” of watching daughter Jade’s high school graduation on May 22 and has enjoyed watching all the kids play basketball, soccer, and volleyball and participate in choir.

The universe hasn’t explained itself to Ojeda. She doesn’t claim to understand why she has borne the toll of disease. But she has learned from her experience.

“I concluded that people can go through really hard things and have a beautiful, positive ending,” Ojeda said. “When you are struggling and going through it, it’s hard to see the light at the end of the tunnel. But as long as you believe in yourself and have a good support system and people who love you, you can make it through just about anything in life. A lot of times, I thought, ‘I can’t do this.’ I learned that I could.”

This article was originally published by UCHHealth in June 2023.

MITRAL VALVE REPAIR

Heart surgeons use robot to improve outcomes

By Greg Glasgow

Even before the robot, the University of Colorado Department of Surgery was leading the way when it comes to mitral valve surgery. Morbidity and mortality outcomes for mitral valve repair at CU are well below the national average. In 2019, CU surgeons began using a minimally invasive approach to repair leaky heart valves that affect blood flow in the body and can lead to congestive heart failure.

“Guidelines support repairing — rather than replacing — mitral valves when possible,” says Jessica Rove, MD, associate professor of cardiothoracic surgery. “We know that mitral valve repair is very successful in helping patients avoid the sequelae of severe mitral regurgitation including dilation of the heart chambers, atrial fibrillation, and heart failure.”

The minimally invasive approach involves going between the ribs on the right side of the body to operate on the heart. Surgeons don’t have to break the breastbone or any other bones, giving patients a quicker and potentially easier recovery.

ENTER THE ROBOT

In 2022, Rove and Joseph Cleveland, MD, chief of cardiothoracic surgery, began looking to improve patient outcomes even more. Rove and her team traveled to several sites around the country and trained for months to gain proficiency in the technology-aided technique.

“With the robot, you can drive the camera into the heart and get a 3D, high-definition view of the valve,” she says. “It’s a level of detail that you could never get traditionally, even wearing loupes. Additionally, your robotic instruments have a greater range of motion than the human hand, and your instruments are inside the heart. You are essentially doing the procedure with your hands inside the heart.”

Rove and her team performed their first robotic procedure in February 2023 and had done 12 more as of late July. Efficiency has improved, she says, and the results have been great. The robotic procedure has also meant a reduced length of stay in the hospital after surgery — from an average of 6.8 days to 3.8.



Jessica Rove, MD

EASIER RECOVERY

Additional advantages of minimally invasive robotic surgery, as opposed to a traditional sternotomy, include less blood transfusion, easier wound healing, and fewer restrictions after the procedure.

“If you have a sternotomy, you can’t lift more than 10 pounds for four weeks; you can’t drive a car for four weeks,” Rove says. “With the minimally invasive procedure, I had one patient who was playing tennis a month after surgery. That doesn’t happen after a sternotomy.”

One of the first patients to undergo the robotic procedure was Jeannie McNeilly, of Denver, who had a robotic mitral repair in February 2023.

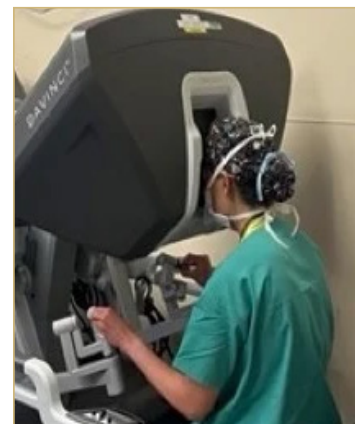
“At my first appointment, I was favorably impressed by Dr. Rove as she stared at the computer screen showing my faulty mitral valve,” McNeilly says. “I could see it in her eyes that she was thinking, ‘I know what I’m going to do when I get in there.’ I could see the wheels turning.”

McNeilly had almost no pain after her procedure, and she was up and walking the same day as her surgery. She left the hospital after three days and did the rest of her recovery at home.

Robotic mitral valve surgery also presents a greater collaborative opportunity for the surgical team. While Rove sits behind the controls of the robot, other highly trained specialists are at the patient’s bedside, assisting and managing the robot.

“With traditional heart surgery, the surgeon controls a lot at the bedside,” says Rove, who did her surgical residency at the CU Department of Surgery and became the department’s first female attending cardiothoracic surgeon when she returned in 2018 after a fellowship at Washington University in St. Louis.

“When you expand to using the robot for cardiac surgery, you are dependent on a team of people, and everybody has to speak up,” Rove continues. “We had to feel very comfortable communicating as a team, and that changes the dynamic in the operating room. We put a lot of trust in each other. It has really elevated the game of some of the people involved in the operating room, and it’s really highlighted some of the skills of other people on our team, which has been very fulfilling to see.”



Jessica Rove, MD, associate professor of surgery, says that using the technology is like “doing the procedure with your hands inside the heart.”



Mia Harris, a research intern from Metro State.

INSPIRING ASPIRING SCIENTISTS

Metro State students get lab experience at CU Anschutz

By Greg Glasgow

Olivia Rissland, DPhil, is seeing her research through different eyes these days.

As a founder and facilitator of the MSU/Anschutz Program for Meaningful Undergraduate Research Experiences (MAP Scholars), Rissland, associate professor of biochemistry and molecular genetics, has found herself re-inspired by the undergraduate students from Metropolitan State University of Denver whom the program brings to campus to learn about research.

“They’re doing these things that we think are just standard, everyday things, but when they do it for the first time, it’s so exciting for them,” she says. “You forget about the cool parts, the parts that were exciting

when you first started. It gets lost in the day-to-day. Having somebody experience it for the first time and seeing them realize how cool it is that we’re looking at molecules in cells, it brings huge energy to a lab.”

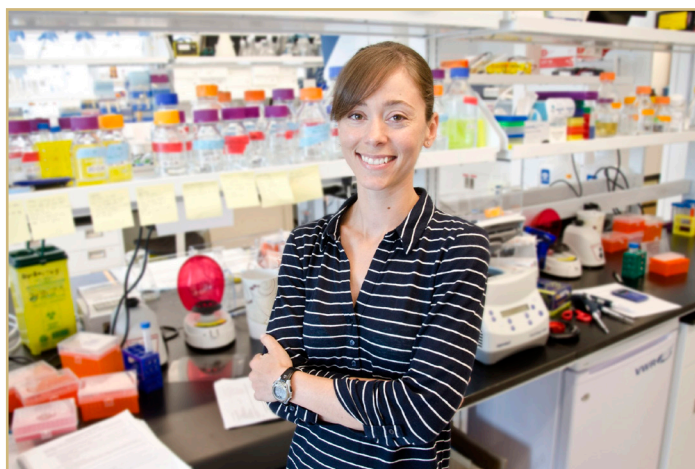
CREATING OPPORTUNITIES

MAP Scholars was born in 2019, when Rissland and Srinivas Ramachandran, PhD, assistant professor of biochemistry and molecular genetics and CU Cancer Center member, learned more about Metro State, a public university in downtown Denver where more than 50% of the student body are students of color. The program began accepting applications in 2020 and welcomed its first cohort of 12 students in 2021. Undergraduates come to campus for a summer, then stay on longer if they like the experience.

“Metro has really great students, but they don’t have as many research opportunities,” Rissland says. “It’s a commuter college, and a lot of the students are working jobs that are not on their career path. We thought this would be a really great way of helping them get exposed to research, but also bringing some more undergraduates onto the campus, which could help with recruitment for our graduate programs.”

The students are assigned to labs led by CU School of Medicine researchers and placed on one of two tracks: a general track, which teaches freshmen and sophomores the basics of lab research, or a research track for juniors and seniors with some research experience who want to get more involved with specific research projects.

“A huge thing for many of the students is that they don’t always understand that these paths are available to them,” Rissland says. “These students are incredibly talented, they’re hardworking, they’re smart, but because a lot of them come from nontraditional backgrounds, they don’t see themselves in a lab.



Olivia Rissland, DPhil, associate professor of biochemistry and molecular genetics

“More than one student has told me that through the internship experience, they understood what their college courses were trying to teach them”

“For freshmen and sophomores, our hope is that just being in that environment might help them think, ‘Oh yeah, I could do this. These people are no different than me.’ With the juniors and seniors, we want them to be able to have some ownership of the project.”

A NEW CAREER PATH

One of the Metro students who joined the program in its first cohort is Erica Sterling, who graduated in May and then joined Rissland’s lab as a full-time professional research assistant.

For Sterling, the experience transformed her original goal of going into medicine into being a biomedical researcher.

“I started on this whole endeavor because I was interested in medical school, but then I realized how cool it is to be the first person to see new research and data,” she says. “I also love the troubleshooting aspects. When things don’t work, I find it really fascinating to problem-solve and figure out how to make it work. My family always jokes that I’m a professional student, but that’s kind of what a researcher really is. They’re professional at learning new things.”

PLAYING FOR THE HOME TEAM

For Ramachandran, the MAP Scholars program also is a way for the CU School of Medicine to serve and attract students from backgrounds traditionally underrepresented in medicine, which includes students who make up a large part of the population at Metro State, as well as in the Aurora neighborhoods that surround the CU Anschutz Medical Campus.

“We have a very talented undergraduate population in Denver, but we are not really tapping into that talent,” Ramachandran says. “When we look at the PhD applications to our university, it’s almost like you have a great college basketball team, but then your NBA team is all players from far away. By targeting local students, we are trying to balance that out and give people an opportunity they really deserve but don’t know it exists.”

Students can take science classes at Metro, he says, but doing research on the CU Anschutz campus helps bring that classwork to life.

“More than one student has told me that through the internship experience, they understood what their college courses were trying to teach them,” he says. “They can take a molecular biology class at Metro, but then when they come to the lab and do PCR or cloning, they say, ‘Oh, this is what my professors are trying to teach me.’ They have to work through the intellectual exercise of designing the experiment and interpreting the results.”

Rissland has been gratified to see the interest from researchers in the Department of Biochemistry and Molecular Genetics in having undergraduates help with their research — and equally gratified to see the interest from Metro State students who otherwise may not have had the opportunity to explore careers in medical science.

“To have people understand, ‘What does it mean to be a scientist? What does it mean to look at the world as a scientist does? How does that influence how you think about things, even in your day-to-day life?’” Rissland says. “To give people those tools is hugely rewarding.”



*Srinivas Ramachandran, PhD,
assistant professor of
biochemistry and molecular*



*Professional research assistant and former Metro State intern Erica Sterling,
center, works with current interns Mia Harris, Sarah Rones, and Edgar Provencio.*

ORIGIN STORY

School of Medicine lab offers theory on paired appendages

By Mark Couch

An international collaboration that includes scientists from the University of Colorado School of Medicine has uncovered new clues about the origin of paired appendages – a major evolutionary step that remains unresolved and highly debated.

The researchers describe their study in an article published in May in the journal *Nature*.

“This has become a topic that comes with a bit of controversy, but it’s really a very fundamental question in evolutionary biology: Where do our limbs come from?” says co-corresponding author Christian Mosimann, PhD, associate professor and Johnson Chair in the Department of Pediatrics, Section of Developmental Biology.

That question – where do our limbs come from? – has been subject of debate for more than 100 years. In 1878, German scientist Karl Gegenbaur proposed that paired fins derived from a source called the gill arch, which are bony loops present in fish to support their gills. Other scientists favor the lateral fin fold hypothesis, concluding that lateral fins on the top and bottom of the fish are the source of paired fins.

“It is a highly active research topic because it’s been an intellectual challenge for such a long time,” Mosimann says. “Many big labs have studied the various aspects of how our limbs develop and have evolved.” Among those labs are Mosimann’s colleagues and co-authors, Tom Carney, PhD, and his team at the Lee Kong Chian School of Medicine at Nanyang Technological University in Singapore.

CHASING THE ODD CELLS

For Mosimann, the inquiry into where limbs come from is an offshoot of other research conducted by his laboratory on the Anschutz Medical Campus. In his laboratory, his team uses zebrafish as a model to understand the development from cells to organs. He and his team study how cells decide their fate, looking for explanations for how development can go awry leading to congenital anomalies, in particular cardiovascular and connective tissue diseases.

Along the way, Mosimann and his lab team observed how a peculiar cell type with features of connective tissue cells, so-called fibroblasts that share a developmental origin with the cardiovascular system, migrated into specific developing fins of the zebrafish. It turns out that these cells may support a connection between the competing theories of paired appendage evolution.

“We always knew these cells were odd,” he says. “There were these fibroblast-looking cells that went into the so-called ventral fin, the fin at the belly of the developing zebrafish. Similar fibroblast cells didn’t crawl into any other fin except the pectoral fin, which are the equivalent of our arms. So we kept noticing these peculiar fibroblasts, and we could never make sense of what these were for many years.”

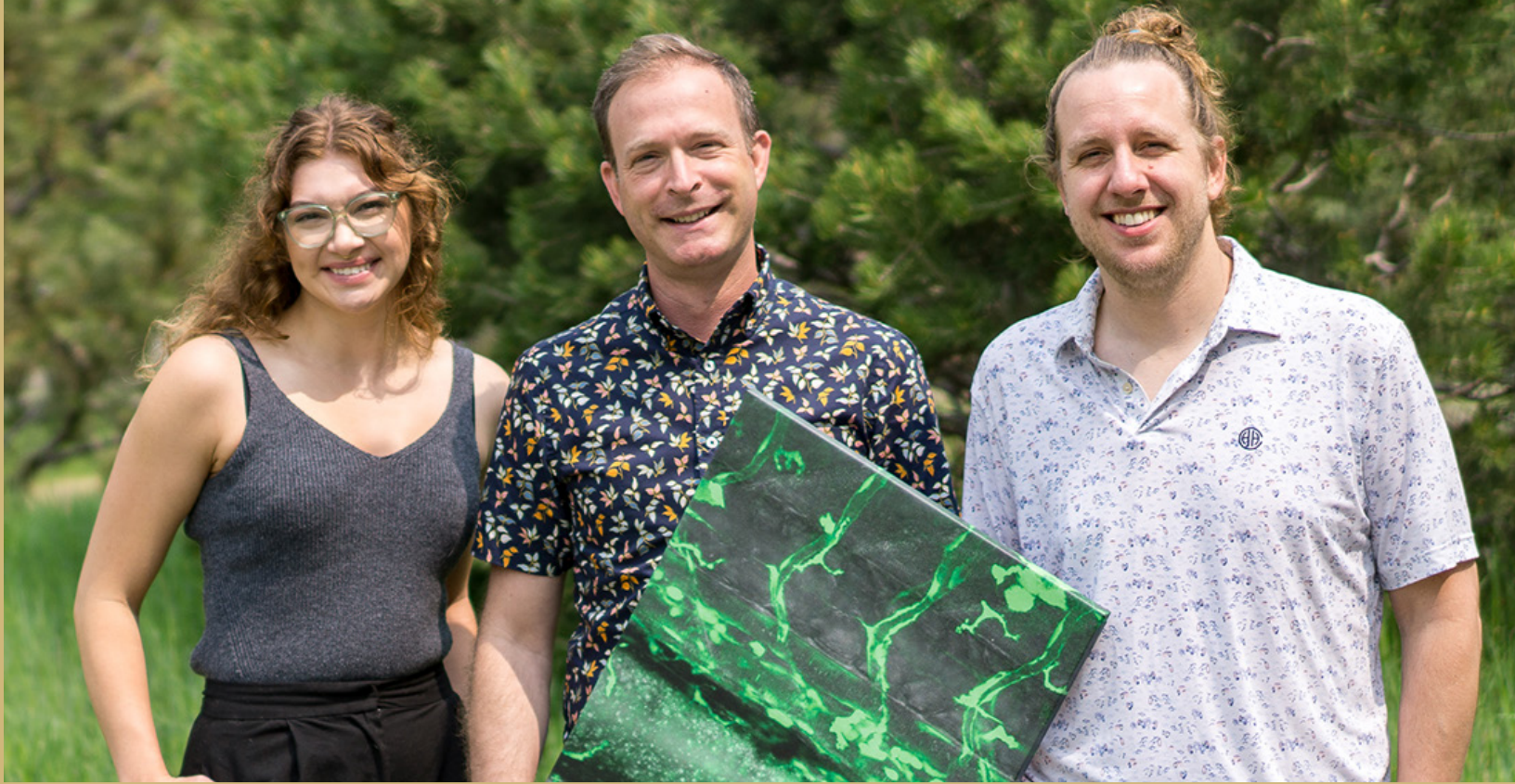
The Mosimann lab has developed several techniques to track cell fates during development in pursuit of their main topic, which is an improved

“It is a highly active research topic because it’s been an intellectual challenge for such a long time,” Mosimann says.

“Many big labs have studied the various aspects of how our limbs develop and have evolved.”

understanding of how the embryonic cell layer, called the lateral plate mesoderm, contributes to diverse organs. The lateral plate mesoderm is the developmental origin of the heart, blood vessels, kidneys, connective tissue, as well as major parts of limbs.

The paired fins that form the equivalent of our arms and legs are seeded by cells from the lateral plate mesoderm, while other fins are not. Understanding how these particular fins became more limb-like has been at the core of a long-standing debate.



Hannah Moran, Christian Mosimann, PhD, and Robert Lalonde, PhD, with a microscopy panel of labeled cells.

DEVELOPING NEW THEORIES

Hannah Moran, who is pursuing her PhD in the Cell Biology, Stem Cells and Development program in the Mosimann lab, adapted a method of tracking lateral plate mesoderm cells that contribute to heart development so that researchers could track the peculiar fibroblasts related to limb development.

“My primary research project focuses on the development of the heart rather than limb development,” Moran says, “but there was a genetic technique that I had adapted to map early heart cells, and so we were able to implement that into mapping where the mysterious cells of the ventral fin came from. And turns out, they are also from the lateral plate mesoderm.”

This crucial discovery provides a new puzzle piece to the big picture of how we evolved our arms and legs. Increasing evidence supports a hypothesis of paired appendage evolution called the dual origin theory.

“Our data fit nicely into this combined theory, but it can also stand on its own with the lateral fin theory,” says Robert Lalonde, PhD, postdoctoral fellow in the Mosimann lab. “While paired appendages arise from the lateral plate mesoderm, that does not rule out an ancient connection to unpaired, lateral fins.”

By observing the mechanisms of embryonic development and comparing the anatomy of existing species, research groups like Mosimann’s can develop theories on how embryonic structures may have evolved or have been modified over time.

“The embryo has features that are still ancient remnants that they have not lost yet, which provides insight into how animals have evolved,” Mosimann says. “We can use the embryo to learn more about features that just persist today, allowing us to kind of travel back in time.”

“We see that the body has a fundamental, inherent propensity to form bilateral, two-sided structures. Our study provides a molecular and genetic puzzle piece to resolve how we came to have limbs. It adds to this 100-plus year discussion, but now we have molecular insights.”

INTERNATIONAL COLLABORATION

Collaborations with colleagues in laboratories across the country and around the world are another important part of the study. Those scientists bring additional specializations and contribute data from other models, including paddlefish, African clawed frogs, and a variant of split-tail goldfish called Ranchu, to study embryonic development.

“There are labs on this paper that work on musculoskeletal diseases, toxicology, fibrosis. We work on cardiovascular, congenital anomalies, cardiopulmonary anomalies, limb development, all related to our interest on the lateral plate mesoderm,” says Mosimann. “And then together, you get to make such fundamental discoveries. And that’s where team science enables us to do something that is more than just the sum of the parts.”

For all the considerable work and significance of the study, the Mosimann team recognizes that it is a key step, but not the end of the journey in the debate about paired appendages.

“I wouldn’t say we’ve solved the question, or even disproven either existing theory,” says Lalonde. “Rather, we’ve contributed meaningful data towards answering a major evolutionary question.”

PREVENTING GUN HARM

School of Medicine launches Firearm Injury Prevention Initiative

By Colleen Miracle

The University of Colorado School of Medicine has launched the Firearm Injury Prevention Initiative, bringing experts on the CU Anschutz Medical Campus together to serve as a trusted community and national resource for firearms-related research and solutions.

Led by Emmy Betz, MD, MPH, the Firearm Injury Prevention Initiative will conduct and disseminate research on effective approaches to reduce injury and death, design resources and tools for practice, mentor future firearm injury prevention professionals, and work alongside local communities to develop effective and relevant solutions.

Firearms are a growing cause of death in the United States, and the CU School of Medicine is positioned to be a leading voice on this public health crisis. The \$4.5 million initiative is led by the Department of Emergency Medicine with support from the CU School of Medicine Dean's Office and the departments of medicine, pediatrics, psychiatry, and surgery.

The initiative looks for ways to prevent firearm harm of all types, including suicide, domestic violence, unintentional shootings, community violence, school violence, mass shootings, and police-involved shootings. In 2020, Colorado had the 22nd-highest firearm death rate in the country and the seventh-highest suicide death rate. Between 2016 and 2020, there were 4,248 firearm deaths in Colorado. Seventy-five percent of those deaths were by suicide, and twenty-one percent were by homicide.

"We feel the impact as clinicians and community members, from mass shootings but also from the daily toll of firearm deaths from suicide and community violence" says Betz, director of the initiative and professor of emergency medicine. "I am grateful to the School of Medicine and campus leaders for supporting us in addressing the public health crisis of firearm injury."

LOCAL AND NATIONAL COLLABORATION

CU faculty, researchers, and initiative staff collaborate with public health professionals, clinicians, policymakers, and local communities. With Colorado's strong culture of hunting, ranching, sport shooting, and firearm ownership, there are many opportunities for outreach and partnership with firearm-owning communities and to learn from them.

Attending gun shows to distribute locking devices is one of several educational areas for the initiative. Betz co-founded and co-leads the Colorado Firearm Safety Coalition, a collaborative effort between public health and medical professionals and firearm retailers to reduce firearm suicides. Joe Simonetti, MD, MPH, director of mentorship and education for the initiative, leads panel discussions locally and nationally and meets with school district leaders to support school safety considerations.

"The School of Medicine's investment in the initiative means a tremendous amount for the future of firearm injury prevention," says Simonetti, who is an assistant professor of medicine. "This gives us the opportunity to build infrastructure and support faculty to ensure we're able to provide outstanding mentorship and training for the next generation of researchers and public health practitioners."

Working with Colorado's military community, which includes seven military bases, the U.S. Department of Veterans Affairs, and the CU Center for Combat Medicine and Battlefield Research, the initiative seeks to serve as a primary local resource for research and education on suicide prevention, mental health support, and military community engagement on injury prevention. The initiative works with Buckley Space Force Base leadership on tactics to prevent firearm-related injuries in military settings.

The initiative reaches beyond Colorado through webinars, where it hosts discussions on issues including firearm storage and rural community violence intervention.

CONNECTING RESEARCH TO PRACTICE

Faculty research covers firearm injury, health care provider counseling, and community-based programming.

Betz and Erin Kelly, DrPH, MA, director of research and evaluation for the initiative, are collaborating with the Colorado Office of Gun Violence Prevention on developing and maintaining a state resource bank for data, research, and statistical information regarding firearm injuries and deaths, and their prevention.

Another project, led by Betz and Chris Knoepke, PhD, MSW, LCSW, law enforcement lead for the initiative and instructor of medicine, is examining training for Extreme Risk Protection Orders. With funding from the Fund for a Safer Future, the study team is partnering with the Colorado Attorney General's Office to identify and address law enforcement training needs for these orders.

"We want our collaborators to know that we have a common goal of health and security, respect for diversity, and consideration of a range of views. We must engage with impacted communities and those with lived experiences to be a well-rounded initiative," says Betz. "We must address this public health crisis with research, education, and collaboration."



Emmy Betz, MD, MPH, leads the Firearm Injury Prevention Initiative.

TASTES GREAT

CU researcher links genetics with dietary intake

By Kara Mason

For geneticist Joanne Cole, PhD, food is life.

Beyond trying a new recipe and seeking out new restaurants, food is a key ingredient in her work identifying the connection between genetics and nutrition.

Three years ago, Cole, assistant professor of biomedical information, identified 814 regions in the genome associated with dietary intake. Analyzing a large sample of individuals' food preferences, she made a novel discovery that 300 of those genetic regions are linked to the consumption of specific foods.

“The foods we’re eating are influenced by all sorts of things, including our macro environment, how much money we have, who’s around us, and how we’re raised,” Cole explains. “What’s amazing is we can now finally study the genetic component, which is small, given all the environmental factors that influence what we eat, but it’s there. It’s real.”

CONNECTING GENETICS AND DIET

In a presentation for the American Society for Nutrition 2023 Annual Meeting, Cole dives into whether genes have a direct or indirect impact on dietary intake, hoping one day that genetics might be used to achieve personalized nutrition.

A genetic variant, for example, could be the reason for liking the taste of carrots. If so, Cole’s work could possibly identify a compound in carrots directly linked to that genetic variation, making it taste better to some individuals. Knowing that relationship — what researchers call a “biological mechanism” — could potentially inform nutritional interventions.

“If we know that a person has a strong liking toward a specific compound because of a specific genotype, and it triggers a positive reward response in the brain, then we can find all the foods with that compound,” she explains. “Then we could start creating personalized nutrition plans for people based on their genetics and opening their eyes to foods that have that have similar reward responses but have healthier profiles.”

Knowing the connections between food preference and genetics can open a whole world of opportunity.

“I think of the biological mechanisms as being pretty valuable,” she says. “We all have different food preferences and eating habits. Are there ways to incorporate the biological mechanisms influencing eating habits? They might have more of an impact in developing nutrition guidance that’s specific to certain people, because taste is the primary driver for food choice.”



Joanne Cole, PhD

Lactose-free dairy milk is a similar example of how Cole’s other discoveries could be applied in the future. Some people can’t digest milk because of the lactose, but “once scientists figured out the biological mechanism, they found a way to make a product that had the same health ingredients but already removed the lactose sugar,” Cole explains.

These discoveries could also lead the way for improving lifestyles of those at risk for life-altering diseases, such as diabetes.

LEVERAGING DATA

Cole and her lab team learn about the connections between genetics and diet through questionnaires mostly made available through large cohorts and biobanks. In this research, Cole used the UK Biobank, a database that contains in-depth genetic and health information from a half-million participants in the United Kingdom.

Participants answered questions about how often they eat a particular food, ranging from fruit and vegetables to alcohol and bread.

“The sample size enabled the genetic analysis of these traits that have a small genetic component,” Cole says. “We couldn’t study these connections before, so that was a major innovation.”

Cole sees a whole future where her research could be relevant in optimizing diet choices and personal nutrition, and perhaps even a choose-your-own-adventure cooking class where students prepare a meal that’s based on their food preferences and genetic profile.

“I just think that would be so cool,” she says. “It might be a little pie in the sky right now, but it’s fun to think about.”



For some dog DNA tests, companies require pet owners to upload a photograph of the pet with the DNA sample. In other tests the photo can be optional. This photo of Lila, a purebred beagle, accompanied her cheek swab. Photo courtesy of Monica Munoz-Torres, PhD, associate professor of biomedical informatics.

BACKGROUND CHECK

CU data scientists find flaws with dog DNA-testing companies

By Kara Mason

Lila is a registered purebred beagle. But depending on which company does her DNA testing, she might be part rottweiler, part American foxhound, or not a beagle at all.

A study by researchers in the Department of Biomedical Informatics (DBMI) at the University of Colorado School of Medicine revealed that some dog DNA testing companies may rely less on genetics than on a photograph of the dog provided by the customer.

To conduct the study, the researchers selected six direct-to-consumer (DTC) dog DNA testing companies. In Lila's case one of those companies concluded that Lila was 50% poodle, 50% bichon frisé, and 0% beagle.

"I was at a meeting where we were talking about the reliability of direct-to-consumer genetics tests, and we hatched this plan to investigate dog breed tests," says DBMI founding chair Casey Greene, PhD. "Somebody said that these testing companies have you upload a photo of your dog and I thought, 'Are they actually doing a DNA test at all?' That's when we decided to figure it out."

FETCHING RESULTS

The study, which began in late 2021, recruited 12 dogs of different breeds from across the country. Each dog was registered or eligible for registration with a breed organization to ensure its status as purebred.

Cheek swabs were taken from the dog and sent to six different DNA-testing companies that claim to test canine DNA to determine breed.

"We wanted to work with dogs where we already had a pretty strong idea of what the test would show," explains Halie Rando, PhD, postdoctoral researcher in Greene's lab and lead researcher for the study. "By working with purebreds, we thought we knew what the test results should look like."

For half the tests, the sample was sent with an accurate photo of the DNA donor, but for the other half, the sample was submitted with a photo of a different dog, one that was genetically and physically much different.



Halie Rando, PhD, led the study of dog DNA tests while she was a postdoctoral researcher in Casey Greene, PhD's, laboratory.

“One of our concerns was that some of these tests can have real financial implications for a person’s ability to rent, get insurance, or live in a particular city without compelling evidence that it is a valid result.”

“In one swap, we paired a photo of a Brittany spaniel, which is a big, silky-haired dog, with a Chinese crested, which is a small, hairless dog,” Rando says. “We made sure that there was no chance that the two dogs would get conflated by the nature of being closely related.”

In the case of the Chinese crested dog, five of the six companies reported results that included a photo of the spaniel came back mostly accurate. But one test, completed by Accu-Metrics, determined in an “official analysis” that the dog was part border collie and part golden retriever — a conclusion that seems to align more with the photo that was submitted rather than with the DNA sample.

Researchers say that the DNA-testing companies should be able to conduct accurate genetic testing without a photograph of the dog.

“In most cases, at least one test provided a breed prediction that did not match the registered breed,” researchers write in their findings. “Because our analysis focused on evaluating whether the reported ancestry deviated from the expected ancestry, which in purebreds is 100% of a single breed, minor differences in how results were reported by different companies did not affect our analyses.”

Variances in testing mechanisms, or the markers used in testing, might explain why some tests reported Lila to be 100% beagle and others reported her to be 90% beagle. It doesn’t explain why one test would report she’s not a beagle at all.

“Even among our team of people well-versed in genetics, it can be difficult to understand these small differences, what’s spurious, and what’s meaningful,” Rando says. “It’s a really challenging environment to navigate even with significant genetic literacy.

BREED BANS

Inaccurate DNA testing can sometimes have significant consequences for pet owners.

Controversial breed-specific legislation started gaining popularity more than four decades ago, when some cities outlawed people from owning certain breeds, such as “pit bulls” and rottweilers. Insurers and property-leasing companies have used breed lists to deny coverage and housing to people owning specific dog breeds.

“One of our concerns was that some of these tests can have real financial implications for a person’s ability to rent, get insurance, or live in a particular city without compelling evidence that it is a valid result,” Greene says.

In the CU study, a company called DNA My Dog identified a bulldog as a wolf hybrid; it also determined that Lila the beagle was a rottweiler. Accu-Metrics identified a German shorthaired pointer and a golden retriever as having ancestry that would qualify them as part pit bull.

“None of these ancestry predictions were supported by any other DTC tests. Therefore, it would be possible for dog owners to face severe financial repercussions in terms of home insurance and even housing rental eligibility if they view the results of a DTC test as definitive and self-report a dangerous breed, or if DTC canine genetic testing were adopted for housing and insurance purposes,” the researchers say.

While the researchers didn’t investigate the health or trait analysis that some of the companies offered in the DNA testing, they say they’re an added cause for concern for pet owners and veterinarians.

Ancestry conclusions from Accu-Metrics were more often at odds with many of the dogs’ pedigree registration, even for the 10 American Kennel Club-registered dogs, which requires dogs to meet strict breeding standards over many generations.

“Genetic information can contribute to pet owners’ decisions regarding their pets’ health, and when this information is incorrect or is being interpreted incorrectly, it can lead to tragedy,” the researchers say.

Rando and Greene say dog owners should be cautious about dog DNA testing and the companies that offer those services.

“Not all tests are created equal,” Greene says. “It is important the services are evaluated independently with careful experimental designs to understand their strengths and weaknesses. That’s part of what we contribute as scientists.”



Casey Greene, PhD, chair of biomedical informatics

ALUMNI CORNER



Caitlin Ritz, MD '23



Shilpa Tummala, MD '23

CONGRATULATIONS CLASS OF 2023

The University of Colorado School of Medicine Hooding & Oath Ceremony was held on Monday, May 22, 2023, at Boettcher Commons, with 173 graduates, their families, and friends celebrating this milestone occasion. George A. “Doc” Lopez, MD '73, who received an honorary doctor of humane letters, gave the alumni address.

The CU Medical Alumni Association and CU Alumni Relations Office would like to express our gratitude to our graduating student representatives on the CU Medical Alumni Association Board of Directors: Caitlin Ritz, MD '23, and Shilpa Tummala, MD '23. Ritz is headed to Thomas Jefferson University for residency in neurological surgery. Tummala is headed to the University of Utah for residency in obstetrics and gynecology. We thank them for their service to the board.

CU MEDICAL ALUMNI ASSOCIATION HOSTS “AN EVENING AT THE OPERA”

The CU Medical Alumni Association hosted its annual cultural event, bringing together more than 60 alumni, students, residents, faculty, staff, and guests for an evening that included a reception and performance of Turandot, presented by Opera Colorado.

Taylor Triolo, MD '13, president of the CU Medical Alumni Association Board of Directors, welcomed guests and spoke about opportunities to become involved with the alumni association. First-year medical student Garrett Healy thanked generous alumni for their continued support through mentorship and philanthropy.

The CU Medical Alumni Association has hosted an annual cultural event for over five years. We appreciate those who attend and support these events, and want to thank the engagement and activities committee, chaired by Jan Kief, MD '82, and Diana Lujan, MD '85, for helping choose the 2023 cultural event.



WAYS TO GET INVOLVED

Many CU alumni choose to “pay it forward” by donating their time. There are many ways for alumni to get involved with the school, current medical students, and housestaff, including:

- Joining the CU Medical Alumni Association Board of Directors.
- Becoming part of the engagement and activities committee, fundraising committee, or awards and nominations committee.
- Mentoring a medical student and helping their community project through the Innovations in Medical Education initiative.
- Becoming a FirstUp mentor for a medical student.
- Volunteering as an Admissions Interviewer and interview perspective medical students.
- Attending Specialty Speed Networking Events and speaking to current medical students about your specialty and current practice setting.
- Becoming a preceptor. Preceptors encourage problem-solving and reasoning skills in their student while teaching biomedical sciences.

For more information or to get involved, please contact Director of Alumni Relations and Advancement Vanessa Duran at Vanessa.Duran@cuanschutz.edu.

CU MEDICAL ALUMNI ASSOCIATION BOARD

The CU Alumni Relations Office and Office of Advancement thanks the CU Medical Alumni Association Board of Directors who advance and influence the interest of our alma mater, supporting current medical students, and providing opportunities and programming for alumni.

Dennis Battock, MD '64

Diana Lujan, MD '85

Michael Piel, MD '69

John Bell, MD '65

William Maniatis, MD '65

Robert Rigg, MD '82

Laurence Chan, MD

Sarah Milliken-Glab, MD '08

Matthew Rustici, MD '08

Audrey Corson, MD '82

Nia Mitchell, MD, MPH '10

Jessica Smith, MD '20

Mark Goncalves, MD '82

Theodore Ning, MD '75

Taylor Triolo, MD '13

Srinivas Iyengar, MD '01

Gina Nelson, MD, PHD '94

Linda Williams, MD '84

Jan Kief, MD '82

Jessica Parr, MD '16

Medical Student Board Representatives:

Cate Alder, MS1

Kylene Desmith, MS1

Ashlyn Richie, MS2

George Burnet, MS2

Garrett Healy, MS2

Ananya Shah, MS2

As the board evolves, would welcome our newest members:

Jennifer McLellan, MD '07

Douglas Scott, MD '81

Paul Overlie, MD '74

For their service to the board, we thank:

Donald Crino, MD '91

John Sharp, MD, '67

Denis Keleher, MD '64



WHITE COAT AND MATRICULATION CEREMONY

On Friday, July 28, the University of Colorado School of Medicine held the annual White Coat Ceremony, welcoming 184 matriculating medical students. Alumni, in their white coats, distributed new stethoscopes donated by 140 generous alumni. The gift of stethoscopes is a long-standing tradition for the CU Medical Alumni Association. Students receive CU MAA-branded stethoscopes.

If you are interested in donating a stethoscope to a medical student, please contact Director of Alumni Relations and Advancement Vanessa Duran at Vanessa.Duran@cuanschutz.edu.

MEDICAL ALUMNI AWARDS

Congratulations to the following alumni on being selected for the 2023 CU Medical Alumni Association Awards:

- Silver and Gold: **Jack Cochran, MD '73**
- Richard Krugman Distinguished Service Award: **Audrey Corson, MD '82**
- Distinguished Achievement: **Reginald Washington, MD '75**
- Humanitarian: **Stephen Berman (Posthumous), Residency 1975**
- Recent Graduate Achievement Award: **Cleveland Piggott, Residency 2018**
- Recent Graduate Humanitarian Award: **Carlie Field, MD '15**

These awardees will be recognized at the Silver & Gold Alumni Banquet on December 8, 2023. If you are interested in attending this event, please contact healthalumni@cuanschutz.edu.

IHAB KAMEL NAMED CHAIR OF RADIOLOGY

Ihab Kamel, MD, PhD, professor of radiology and oncology at Johns Hopkins School of Medicine, has been named the next chair of the Department of Radiology, effective Sept. 5, 2023.

Kamel is an accomplished clinician, productive researcher, and active mentor who has been on the Johns Hopkins faculty for more than two decades. He is an internationally recognized expert in using functional MRI to quantify early tumor response to therapy. He is also an authority in hepatobiliary and pancreatic imaging. “I am excited to join the CU School of Medicine and the Anschutz Medical Campus, where we will have many opportunities to work together to build programs and improve patient care,” Kamel said. “I am confident that working together we can offer outstanding clinical care and excellent training experiences that are based on innovative research.”

Kamel joined Johns Hopkins Radiology in 2000 and served as Clinical Director of MRI from 2008 until 2019. During his tenure, he significantly expanded MRI operations across the Johns Hopkins Health System. He served as chair of imaging at Johns Hopkins Bayview Medical Center from November 2018 through July 2021.

At Johns Hopkins, he developed a multidisciplinary clinic that includes liver surgery, transplant surgery, hepatology, interventional radiology, and oncology to discuss complex liver cases’ diagnosis and management. These activities have attracted new patients, generated new clinical revenue, and fostered interdepartmental teaching and research collaboration.

Kamel succeeds Gerald Dodd, MD, who joined the School of Medicine as chair and professor of radiology in 2008.

\$50 MILLION GIFT TO IMPROVE PATIENT CARE

The Anschutz Foundation announced in June that it is giving \$50 million to support the Anschutz Acceleration Initiative, a program to



Ihab Kamel, MD, PhD

advance cutting-edge healthcare innovations that are poised to reach patients within the next three to five years.

The initiative will fund research and innovative approaches that range from preventative care and technology to help scientists develop the next generation of therapies and healthcare solutions. This could be through prevention or population health, innovative treatments and diagnostics, novel therapeutic development, medical devices and digital health technologies or other approaches that will transform lives.

“We share a vision with CU Anschutz to address the most complex medical problems and move them forward as quickly as possible,” said Christian P. Anschutz, president of The Anschutz Foundation.

The Anschutz Acceleration Initiative will fund research and innovative approaches that range from preventative care and technology to help scientists develop the next generation of therapies and healthcare solutions. This could be through prevention or population health, innovative treatments and diagnostics, novel therapeutic development, medical devices and digital health technologies or other approaches that will transform lives.

The Anschutz Acceleration Initiative will award grants to CU Anschutz faculty in January 2024.

CU HIGHLY RANKED BY U.S. NEWS

The University of Colorado School of Medicine is No. 8 for primary care and No. 26 for research, according to the latest Best Medical School rankings released in May by U.S. News & World Report. This is the sixth time in the past eight years that the CU School of Medicine has ranked in the top 10 for primary care.

U.S. News compiles listings of medical schools in two categories — primary care and research — based on surveys and data reviews of accredited medical schools in the United States. Using the survey responses and data, the magazine then assigns rankings.

The magazine also provides rankings of specific specialties based on ratings provided by medical school deans and senior faculty from surveyed schools. This year, family medicine ranked No. 7 and pediatrics ranked No. 8. The CU School of Medicine Physician Assistant Program is also ranked No. 8.

“The School of Medicine is focused on providing excellent training, research, and clinical care, and we will continue to focus our efforts on meeting the needs of our students, communities, and patients and their families,” says Dean John J. Reilly Jr., MD. “Our faculty and staff have a commitment to service that is a source of strength for our state and for the University of Colorado.”

DOCTORS OF OLD 'FITZ' REUNITE

More than 100 physicians who served at the Fitzsimons Army Medical Center reunited on the Anschutz Medical Campus in July in the first gathering since the army medical center was shut down on the 1995 recommendation of the Defense Base Realignment and Closure Commission.

Originally known as U.S. Army General Hospital No. 21, it established a national reputation of excellence in patient care, training, and research over its 78-year history. The hospital originally opened in 1917. The rebuilt Fitzsimons General Hospital, which is now known as the Fitzsimons Building and home to many administrative offices for our campus, opened in 1941, just days before the attack on Pearl Harbor.

As Nicholas DiBella, MD, walked through the bright halls of UCHealth University of Colorado Hospital, memories came flooding back.

"I'm probably one of the oldest people at this reunion," said DiBella, who would soon reunite with colleagues he hadn't seen for decades. "I was

here in the Vietnam era, and I can remember we had all of these outlying buildings that had been built after World War II. All of these wooden temporary buildings, and we had them full of patients – all of these poor guys and gals coming back from 'Nam. There were patients spread all over the campus.

"So, it's wonderful to see that (the campus) is still being used for health care," added DiBella, who served as chief of hematology-oncology during a second stint up until his retirement in 1984. "I'm proud of that."

Among the attendees were many School of Medicine faculty members, including Col. (Ret.) Sterling West, MD, professor emeritus of medicine in the Division of Rheumatology, who made a presentation on the history of the center. Other School of Medicine faculty who attended the reunion were: Mike McDermott, MD, Steve Johnson, MD, Steve Freeman, MD, Bill Burman, MD, Rose Gates, NP, PhD, and Steve Lawrence, MD.



A group photo of the first-ever reunion of physicians who served at the Fitzsimons Army Medical Center. Photo courtesy of Randall Lee.

GOING GLOBAL

Anesthesiologists in Paraguay

By Kara Mason

Two School of Medicine anesthesiologists traveled to Paraguay in June to offer their help and expertise for a week of complex neurosurgeries.

“The local doctors in Paraguay care deeply about their patients,” says Claudia Clavijo, MD, associate professor and neuroanesthesiology section chief in the CU Department of Anesthesiology. “They have fewer resources, but they are very resourceful.”

Clavijo and Jakob Gamboa, MD, a fourth year anesthesiology resident at the CU School of Medicine who became the first global health fellow in the anesthesiology department this summer, traveled nearly 5,300 miles from Colorado to the South American country with supplies and medication to assist with the neurosurgeries. All patients had complex vascular lesions in their brains, Clavijo says, and had been waiting for their surgeries for a while.

“These would be complicated in any country,” Clavijo says of the cases they took on. “But especially when there are limited resources, like there are in Paraguay.”

The duo worked with nonprofit organization Solidarity Bridge, which focuses its medical care partnership efforts in Paraguay and Bolivia. Both CU physicians say the experience is one that was eye-opening, rewarding, and something they hope to continue.

BUILDING BRIDGES

“Every Paraguayan is Colombian and every Colombian is Paraguayan.”

That popular phrase describing relations between the two countries continued to ring true throughout Clavijo and Gamboa’s visit. Clavijo, who was born in Colombia, says she felt at home working in Hospital Nacional de Itauguá.

“There was a war at the end of the 1800s where three countries were against Paraguay, but Colombia supported the people of Paraguay in a big way,” she explains. “They are still so kind and grateful for Colombians. It was great to share that connection with the patients and the doctors.”

Gamboa, who has traveled and worked in other Latin American countries, says there was a special bond between the visiting doctors and the locals because they share the same goals and values.



Jakob Gamboa, MD, right, and Claudia Clavijo, MD, middle, pose for a photo while working at Hospital Nacional de Itauguá in June. Photo courtesy of Jakob Gamboa.

“One of the reasons why we decided to work with Solidarity Bridge is that the organization and the Department of Anesthesiology global health program share the same vision of providing responsible and ethical care that is sustainable and involves partnerships and working together, not just us coming in and doing it ourselves,” he says.

Each year, the organization directly serves nearly 2,000 patients between Bolivia and Paraguay. Some patients receive subsidies and supplies to cover urgent health care needs, while others undergo surgery like they did at the Itauguá hospital. More than half of the patients the organization serves live in rural communities.

WORKING, TEACHING, AND LEARNING

Days typically started before 7 a.m. for Gamboa and Clavijo and lasted well into the night. Beyond working in the operating room, the two also participated in educational presentations to local doctors.

They found plenty of learning opportunities, too.

“We tried to utilize the resources they have in their local hospital and adapt our methods to their capacity to make sure they can keep doing these surgeries long after we leave,” Gamboa says.

Above all, the two doctors say the trip was a success for providing complex care and building lasting relationships.

“It was very important for us to make sure that we were learning how they do things and why before making any recommendations,” Clavijo says. “That was important for collaboration.”

Getting to know the process allowed Clavijo to make recommendations about funding and government allocations for tools, medication, and other necessary resources doctors might need in the future.

The two CU doctors say they’d like to return to Paraguay to work further with surgery teams. The department is also expanding its international horizon.

“I’m really excited to keep working as a fellow,” Gamboa says. “I will have time and resources as our department continues to do more global health work. We currently have partnerships in Uganda, Ethiopia, and Guatemala. We want to continue to expand internationally and gain more opportunities to improve health care globally.”

BLANK SPACE

Why some Taylor Swift fans report ‘concert amnesia’

By Kara Mason

It’s a concert that many will want to remember forever, but some Eras Tour attendees say that they can’t recall parts of the three-hour jam-packed show orchestrated by pop star Taylor Swift. Even though they were there, singing along at the top of their lungs, and recording songs on their phones, some memories seem to have disappeared.

“Now that it’s over, my brain seems to be trying to convince me I wasn’t there,” one fan posted online after attending a show earlier this year.

“I think we just blacked out from all of the magic,” another writes.

What’s actually happening is a normal function of the human brain, says Joel Stoddard, MD, associate professor in the Department of Psychiatry where he leads the Emotion and Development Laboratory.

“We all have the capacity to forget things, which is good,” explains Stoddard. “The brain can be excitable, and it puts us in a state that doesn’t allow us to record memories as they’re happening, and there are a lot of reasons why that can happen.”

STRESS AND MEMORY

To understand what fans have dubbed “post-concert amnesia,” Stoddard says it’s important to know that stress isn’t always bad. “It’s just something that taxes the physiology of a system,” he says.

Stress and memory can be closely related, creating the right conditions leading the brain to refrain from recording the memory in the first place – which might be the case for many who can’t recall parts of what they just experienced.

Memory and emotions are major functions of the limbic system.

“The most famous structure in that group is the hippocampus,” Stoddard says. “Its whole job is to take what you’re experiencing and lay it down to long-term memory. When the hippocampus gets stressed out or there is an intensely emotional experience the hippocampus may perform differently. Researchers have speculated that this different functioning changes memory.”

Essentially, the short-term memory doesn’t get written to long-term memory, which is why a few hours or days after the show a fan might not remember some parts of the concert.

Swift fans — collectively referred to as Swifties — might also be experiencing dissociative amnesia, a disorder often defined by memory

gaps. The condition can seem peculiar especially when a person knows they were present and enjoying the experience. It’s part of the human experience, Stoddard says.

Feeling a mind-body disconnect might feel like losing oneself in the crowd, an out-of-body experience, or like the event didn’t seem real, which some concertgoers have also reported feeling.

“It’s very common to feel this way when you’re super-excited about something,” Stoddard says.



Joel Stoddard, MD, associate professor of psychiatry, explains that forgetting is a normal function of the human brain, particularly when a person is stressed.

DELICATE MEMORIES

Mindfulness techniques and focusing on being present might help quell some emotions that can lead to dissociative feelings, but overall, there shouldn’t be any cause concern for Swifties. If memory gaps persist, however, it’s important to seek out expert care from a mental health professional.

Memory is also malleable, Stoddard says, so it’s possible that the gap in memory is only temporary.

“These fans might watch a recording of themselves singing along in five or six years and actually remember that moment,” he says.

Memory gaps, including forgetting pieces of an “unforgettable” event, are a normal function of the human brain.

“We are all vulnerable to memory effects,” Stoddard says. “These concerts can be an intense experience for some, and this is one way the brain can respond to overwhelming experience.”

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THE TARU HAYS, MD, ENDOWED CHAIR IN PEDIATRIC HEMATOLOGY

The first endowed chair in pediatric hematology in the Department of Pediatrics was recently established by Taru Hays, MD, and Bill Hays, MD, to provide support for the next generation of clinicians and researchers focused exclusively on pediatric hematology. The fund serves to honor Taru's decades of invaluable work in pediatric hematology and is a meaningful reflection of her lasting legacy at the School of Medicine.

After attending medical school at Seth G S Medical College of KEM Hospital in Mumbai, Taru came to the United States for her residency and completed her fellowship in pediatric hematology and oncology. She is passionate about providing professional development opportunities for new talent in pediatric hematology. This visionary gift from the Hays assures pediatric hematology will be a central focus of the Department of Pediatrics and School of Medicine for years to come. Equally important, the fund honors Taru's decades of immeasurable contributions to CU and future clinicians and researchers who aim to improve the lives and outcomes of pediatric patients facing a hematological diagnosis.



“ *It is my hope that the endowed funds will enhance appropriate and accelerated care for children with pediatric hematologic disorders and will provide educational and research opportunities for present and future generations of pediatric hematologists.* ”

– Dr. Taru Hays

To learn more about the Taru Hays, MD Endowed Chair, please contact Travis Leiker in the Office of Advancement at 303-724-2754 or email travis.leiker@cuanschutz.edu. To make a gift, please visit giving.cu.edu/taruhayschair



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