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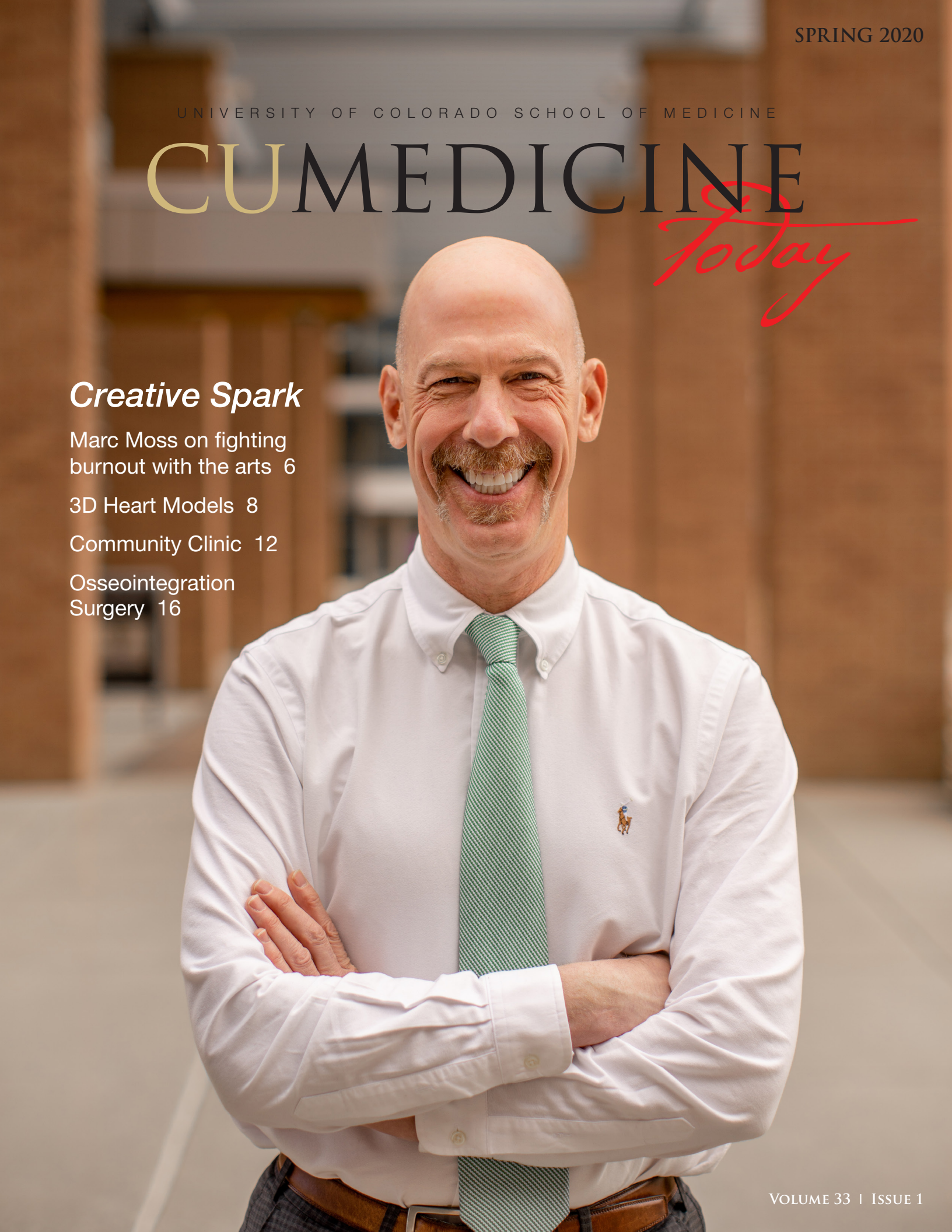
UNIVERSITY OF COLORADO SCHOOL OF MEDICINE

CUMEDICINE Today



Creative Spark

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Dean's Message Spring 2020

This spring, our country and the rest of the world were confronted with a public health crisis unlike any we've ever experienced. The COVID-19 pandemic disrupted life as we know it and resulted in the tragic loss of thousands of lives and the collapse of the national economy.

On the Anschutz Medical Campus, we have made many difficult decisions to reduce transmission of the deadly virus. We closed campus buildings, including those with research laboratories, through the end of April and we cancelled major celebrations including Match Day and the 2020 commencement.

Amid the hardships, we have also witnessed incredible grace, kindness, resourcefulness, compassion, and courage. Faced with potential shortages of personal protective equipment in clinical settings, researchers donated theirs. More than 100 clinicians who work primarily in outpatient settings stepped forward to help in the hospital with the surge of patients. One former trainee shipped surgical masks to campus.

The articles in this issue of CU Medicine Today were assembled prior to the COVID-19 pandemic and reflect the usual outstanding work of the members of the CU School of Medicine community. Production of the issue was delayed due to the broad mitigation measures that required off-campus working for most non-clinical faculty and staff. As a result, we had limited accessibility to the operations that we depend on for designing and printing the magazine.

The content of this issue reflects the old normal for how we did things. As we move forward, we will apply the lessons of our experience during the pandemic to adjust to a new normal.

For example, telehealth will almost certainly be a much larger component of our clinical work. Prior to the pandemic, our telehealth consultations could be counted in the hundreds per month. During the last two weeks of March and in early April, CU providers were handling between 1,000 and 2,000 telehealth calls, and sometimes more, per day. This became possible as a result of changes to reimbursement structures that allowed for these visits to be covered by insurance.

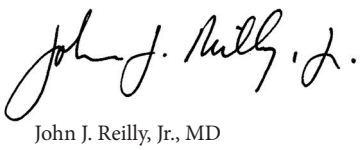
Our laboratories on the Anschutz Medical Campus were vacated during the social distancing, stay-at-home mandates that were necessary to protect the public health. As we look to ramp up those operations, we'll need to reconsider work times and access to ensure that we can come back to productive research.

Our educational programming shifted to online methods during the final months of the 2020 academic year. A quickly assembled pair of courses on COVID-19 offered in-depth studies of virology, hospital medicine, and social determinants of health. Students also received credit for serving as community volunteers in the response.

This has been no ordinary time, but we trained to be ready for such extraordinary circumstances. We are called to address challenges with dedication, compassion, and intelligence. The School of Medicine community has responded in ways that fulfill the noble traditions of our profession and set standards for the days ahead.

I hope you and your family, friends, and colleagues have been and remain safe and healthy, and I look forward to seeing you soon.

With warm regards,



John J. Reilly, Jr., MD
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Reporters locally and nationally turn to the School of Medicine for expertise and research news. Here are examples from near and far.

Marc Moss, MD, professor of medicine and head of the Division of Pulmonary Sciences and Critical Care Medicine, was quoted in the Colorado Sun in March with remarks from a news conference with Colorado Gov. Jared Polis: "The COVID patients we are treating are on average in their 40s and 50s and some are as young as 19 years old. Many of these patients were healthy with no other preexisting conditions. This pandemic can affect anyone."

Adit Ginde, MD, professor of emergency medicine, was quoted in The New York Times in March, in an article about whether it is useful to wear masks in public. "I still believe that masks are primarily for health care workers and for those who are sick to help prevent spreading droplets to others," he said. "However, I do believe that for limited circumstances when individuals must be in close quarters with others, a correctly positioned mask or other face cover for a short duration could be helpful."

Haley Desjardins, MD, a first-year surgical resident, talked in March with 9News, the Denver NBC affiliate, about doing surgical consults with the emergency department and her concerns that younger people need to take the risk of coronavirus more seriously: "We've seen this infection hit the younger population in a way that we don't typically see the influenza virus or some of these other viruses we tend to associate with the elderly population."

Sean O'Leary, MD, associate professor of pediatrics, in March explained to Colorado Public Radio the rationale for stay-at-home orders to confront the threat of coronavirus. "We're all in this together, the more we can practice social distancing, we really need to do our best with that," he said. "The more we do that, the more slowly this virus can spread."

Stephen Cantrill, MD, visiting associate professor of clinical practice of emergency medicine, was interviewed by Kaiser Health News for a March article about his role in helping write the first national crisis standard of care recommendations for states to use as a starting point. "The overall goal is to do the most good for the most people," he said. "This is a way of trying to give some structure, some uniformity and some clarity to those very difficult times."

Jeffrey Wallace, MD, professor of medicine in the Division of Geriatrics, told Colorado Public Radio in March that restricting access early is a lesson Colorado learned from outbreaks of coronavirus at nursing facilities in Washington state. He expressed concern that staff may not have enough paid time off if they become sick. "These are not great paying jobs. These are stressful jobs, and if there are other factors going on in their lives that make it hard for them to come to work it's going to be a big strain. Government policies and announcements included having paid leave for these people so that they can take care of themselves and not be out for extended periods."

Jean Mulcahy-Levy, MD, associate professor of pediatrics, was consulted by the ABC affiliate in Denver to explain how chloroquine, which was considered a potential treatment for the novel coronavirus and COVID-19. "[What] chloroquine is doing is blocking the recycling program and therefore blocking building supplies essentially for cancer cells or infected cells or arthritis cells," she said in March, explaining that the drug is safe. "I'm currently using it in pediatric brain tumor patients. I wouldn't choose to do that if I thought it was a dangerous drug. We think it's safe enough to use on kids."

Shanta Zimmer, MD

Shanta Zimmer, MD, senior associate dean for education and professor of medicine in the Division of Infectious Diseases, was interviewed by The New York Times in March regarding the effects of coronavirus on teaching, including the School's decision to suspend clinical rotations for at least four weeks. "The most important reason is actually to help preserve PPE," she said, referring to masks and other protective equipment, "and to let the important front-line providers have access to that."

Matthew Wynia, MD, MPH, professor of medicine and director of the CU Center for Bioethics and Humanities, described to National Public Radio the need for hospitals to review how to prioritize patient care if there's a resource shortage. "This is a worst-case scenario that we're talking about," he said in March. "We hope we never get there, but we have to get ready for the worst. And it would be irresponsible not to be getting ready right now because of what we're seeing in other places around the world where things really have gone very, very badly and where they have run out of equipment, supplies, staff, space, people. So we need to be prepared for that."

Sean O'Leary, MD, associate professor of pediatrics and an executive member of the American Academy of Pediatrics' Committee on Infectious Diseases, told The New York Times in March: "We're in the midst of something that no one alive has really experienced before." With schools closed, parents and guardians need to adapt some rules, such as limitations on screen time, he added. "I think, for better or worse, what's going to happen is the limits on device time are going out the window."

Saketh R. Guntupalli, MD

Darlene Tad-y, MD

Dan Pastula, MD, MHS

Saketh R. Guntupalli, MD, associate professor of obstetrics and gynecology and director of the Division of Gynecologic Oncology, explained to the Denver Post in March how preparations for COVID-19 patients was changing clinical care decisions. "Normally in our practice we do like 15, 16 major operations a week," Guntupalli said. "That has probably been cut in half. We still operate on the most urgent patients, such as ovarian cancer patients. That's something that can't wait. But, if the surgery can wait, we're asking the patients to wait. They've been very understanding. We're using a lot of telemedicine like Zoom or FaceTime, so we can really interact with our patients to keep them out of the hospital and manage their risk."

Halea Meese, a fourth-year medical student, talked to the Denver-based Fox affiliate in March about how students rallied to community volunteer projects to assist with coronavirus response after the cancellation of Match Day events. She said a "nerve-racking" week was "transformed into excitement over being able to have all of our students helping out and being able to be useful at a time when we feel our health system and our community really needs us."

Thomas Campbell, MD, professor of medicine, offered advice in March to cancer patients about COVID-19. "It's important that people with cancer or other chronic illnesses be vaccinated for influenza and take these precautions to protect themselves not only from COVID-19 but also from influenza and other respiratory illnesses that circulate this time of year," he said on the CBS affiliate in Denver.

Darlene Tad-y, MD, associate professor of medicine, explained to the Denver Post in March the effort to write guidelines for prioritizing coronavirus patients for the Governor's Expert Emergency Epidemic Response Committee. "There may be dire circumstances where our resources are unable or are insufficient to provide optimal care to everyone. Should we reach that moment, I hope community members will feel we have done our due diligence in using the utmost sense of fairness and ethics in what we write."

Jacob Fox, a fourth-year medical student, was interviewed in March by the Denver-based Fox affiliate about volunteer efforts by students to provide aid during the coronavirus pandemic. "A lot of doctors I've worked with say there's three really memorable days in medical school. The first is when you first see your cadaver your first year in medical school, and then the second one is your Match Day, and the third one is your commencement, your graduation. And we've just had those second two kind of taken away from us," he said. "I think that's kind distressing and disheartening for a lot of people, but for me that's been superseded by the feeling I get when I see all my classmates standing up to meet this moment."

Adit Ginde, MD, professor of emergency medicine, explained how vitamin D helps the body produce antimicrobial proteins that kill viruses and bacteria. "If you don't have adequate vitamin D circulating, you are less effective at producing these proteins and more susceptible to infection," he told The New York Times in March. "These proteins are particularly active in the respiratory tract."

Daniel Pastula, MD, MHS, associate professor of neurology, talked to the Denver Post in March about how hospitals in mountain communities were running short of protective gear and other resources need to care for a higher volume of patients. "We're kind of near capacity in the mountains," he said. "Anything we can do to slow this down that's reasonable, we should consider."

Chris Nyquist, MD, MSPH, professor of pediatrics and medical director for infection prevention and control at Children's Hospital Colorado, told the Denver Post in February that providers need to be conscious of their use of face masks. "One of the challenges is, nationwide and internationally, there's limited supplies for the masks, so it's really important for people to use them appropriately," she said.

Richard Zane, MD, chair of emergency medicine, told Colorado Public Radio in March that limited personal protective equipment could mean limited treatment for patients. "Under no circumstances are we going to put a healthcare provider in a position where they have to do something dangerous, period. We're going to do everything possible to protect them, including not putting them in positions where they're not protected. So having enough healthcare providers is paramount."

Jason Persoff, MD, associate professor of medicine, discussed wait times for COVID-19 testing with Colorado Public Radio in March. "We have seen a large surge in patient numbers who are being ruled out for COVID, but test centers locally and nationally are so backlogged, turnaround times are now approaching a week."

Searching For Cures to Lung Diseases

Bioengineer Chelsea Magin creates models that mimic lung tissue

Interviewed by Cynthia Pasquale

Chelsea Magin, PhD, is an assistant professor and the principal investigator of the Bio-Inspired Pulmonary Engineering Lab at the CU Anschutz Medical Campus. She earned her doctorate in biomedical engineering from the University of Florida.

After working at the Kristi Anseth lab in Boulder for a few years, she interviewed for faculty positions but wasn't hired. Discouraged, but wanting to remain in Colorado, she looked to the broader biomedical industry. She worked for the startup Sharklet Technologies, moving up through the ranks to eventually become the director of product development.

"A big part of my role was inventing new ideas for products, writing grants and getting funding so we could do the research, running a team of people who did the research on the benchtop, and writing publications. I loved it," she said.

As the company began to grow, the job became more about paperwork and less about what she enjoyed, so she looked toward academia once more. In 2017, she applied for the position she currently holds with her primary appointment in medicine and her secondary appointment in bioengineering.

"We've had 16 people work in the lab so far. Eight have been undergraduate researchers, three people have gotten their master's degrees, one has been an MD fellow, and two are currently conducting PhD research," she said. "Nine were women and seven are people of color. I'm excited that my lab has been able to promote diversity through who we are and who we represent."

How did you choose this career path?

My father is an electrical engineer and he would take me to Bring Your Daughter to Work Day at his company. We spent a lot of time doing science projects for fun when I was growing up. In the third grade, we built an electromagnet. I brought it to school and showed everybody and thought it was the coolest thing ever. I grew up knowing what engineers do and was excited about science.

I am passionate about diversity and inclusion and there are a couple of different things I've worked on to help. In addition to being a woman in engineering, I'm a first-generation college student. My dad was an electrical engineer, but he did not have a college degree. I had the opportunity through the leadership program Impact Denver to work with a team that started a yearly event called "Ready, Set, College!" We invite as many first-generation college students as we can support. There are speakers who teach these students the basics of finance, time management, scholarships, and how to work with financial aid departments at universities. We have a partner, PCs for People, that helps us donate a laptop to each one of these kids to get them going. Most of these students tend to be underrepresented in their field so it is really rewarding to help create a pipeline for more diversity and inclusion. It's been an amazing experience.

The other thing I'm excited about is a collaboration with a small company in Denver called Couragion. They make an app that helps teach students about STEM careers with videos of role models and scenarios of their everyday work. I've worked with Couragion to be a virtual mentor, creating biotechnology content to help get students interested in the field.

Your lab is developing bioengineered lung models to allow researchers to study disease and regeneration. How are these models developed and will they allow study of a variety of diseases?

When I started my faculty position here in April 2017, I focused on lung research even though I had never worked with pulmonary medicine before. One of the cool things we do with materials is study the properties of the tissue, including how soft or stiff it is, what it is made of and the shape of it, all the way down to a micro scale.

My lab takes that information and builds synthetic materials that mimic those microenvironments. Our goal is to be able to put human cells in these models to better test the mechanisms of disease or find new treatments for diseases. Our models could induce different responses in cells that would occur in their natural environment. In essence, these are perfect microenvironments to mimic lung tissue. There are other labs interested in this type of work, but there aren't many doing this with lungs.

One of my collaborators is Darcy Wagner at Lund University in Sweden. She has been taking the cells out of lungs and then using the remaining extracellular proteins to make natural materials. We call it decellularized extracellular matrix. We combine my synthetic materials with her natural materials to make a hybrid: This gives us the chemical cues of natural materials and control over mechanical properties. When we build models like this, it can be a platform technology that we can apply to study many different types of diseases.

Our lab uses 3D printing to make blood vessels that can contain female or male cells, allowing us to study how the cells respond differently for insight into sex differences and improved treatments.

We are specifically trying to build lung or blood vessel tissue, so our work impacts diseases specific to lungs or blood vessels. We have focused on idiopathic pulmonary fibrosis, a lung-scarring disease that is studied and treated extensively at the University of Colorado and our affiliate institution, National Jewish Health. During this disease, cells remodel the extracellular matrix, which further drives disease progression. This remodeling stiffens the tissue, hence our efforts to create biomaterials that model stiffening better than traditional techniques. We have received a Department of Defense grant to study pulmonary fibrosis in veterans. One of the main reasons the military is interested in this is because veterans from Iraq and Afghanistan have higher rates of the disease than the civilian population. I'm excited about this work so that we can help our servicemen and women, and also translate these results to patients worldwide.

Extracellular matrix remodeling is also a hallmark of pulmonary hypertension, which our lab has begun studying. One of the things I find interesting about pulmonary arterial hypertension is that four times more women get this disease than men; we recently received funding from the CU School of Medicine's Center for Women's Health Research and Rose Community Foundation for this research. Our lab uses 3D printing to make blood vessels that can contain female or male cells, allowing us to study how the cells respond differently for insight into sex differences and improved treatments.

Is your lab working on other projects?
We have started a collaboration with Meredith Tennis, PhD, an assistant professor at the School of Medicine, to engineer ex vivo models of lung cancer. Our lab has invented a material that can be wrapped around very thin slices of lung tissue to keep these tissues alive outside the body for a long period of time. We published a paper in the American Journal of Respiratory Cellular and Molecular Biology showing that this material keeps the tissue alive for at least 21 days, three times longer than previous experiments. We're using that material and the embedding process to induce cancerous lesions outside the body to study cancer progression and treatment.

Many end-stage lung diseases have no cure. While lung transplantation is an option, the demand far outweighs the supply. Thus, I spend a lot of time thinking about how to regenerate or build a new set of lungs. This is the next frontier for our lab because the lung is such a complicated organ, perhaps the most complex one we have.

Recently, you were named Educator of the Year by the Colorado Bioscience Association (CBSA) for work in your lab but also for being a mentor. What did you learn while being a mentor?
I've been an active member of the CBSA, a trade organization for local bioscience companies, since I moved to Colorado seven years ago. The educational mission of CBSA includes training students and teachers in the field. I was passionate about education when I worked at Sharklet as director of product development, so we participated in the Research Experience for Teachers program as a host organization. The program provides middle-school science and math teachers with externship experience, working at a business for a few weeks to learn how science is conducted in industry and what these companies look for when hiring STEM students. Teachers then bring that knowledge back to their classrooms.

One outstanding teacher, Mandi Ruud Singleton, worked on my team to study how stem cells responded to Sharklet micropatterns on surfaces. She had such a great time that she extended her externship, taking up two extra weeks of her summer break to finish the project. This work turned into an abstract that we presented to the World Biomaterials Congress in Montreal.

Two years later in the very first class I taught – Engineering General Chemistry, with 70 students and no teaching assistant – I knew I needed to assign some group projects. I immediately called Mandi, who taught me how to implement problem-based learning techniques to create group assignments in the classroom. She suggested using real-world problems as the basis for the assignment and I found one that I thought students would thoroughly enjoy.

Did you know that when astronauts are wearing their launch and re-entry suits, they don't have a way to go to the bathroom? NASA decided that this was unacceptable and put out a call for innovative ideas for dealing with human waste in space. I thought this "space poop challenge" was perfect and directed my students to use chemistry and engineering principles to solve the problem. My students not only invented novel ways to deal with space poop, but also got to talk to scientists from NASA as well as the finalists from the real challenge. This quick introduction to a new pedagogy technique from Mandi made it all happen.

Building Professional Resilience Through Creative Arts

Marc Moss wants to improve care by reducing burnout

By Ankita Arora

Fifteen years ago, Marc Moss, MD, was running a health study in Atlanta that looked at the long-term outcome of ICU patients, focusing on their psychological distress and symptoms of depression and anxiety.

That's when he made an unexpected discovery.

Several research coordinators running the study were former ICU nurses and they were telling Moss that the symptoms they observed in their patients were the same as the reasons they left nursing.

The words of those former ICU nurses provided the eureka moment that led Moss and his research team in a new direction. Collectively, they saw an unmet need to understand the effects of the working conditions in critical care units on health care providers. Moss and his research team found widespread presence of anxiety, burnout, and mental stress among the professionals who were there to care for others.

"In the ICU, we see a lot of tragedy and are never taught or given the right skillset to learn how to deal with it," said Moss, who is now head of the Division of Pulmonary Sciences and Critical Care at the University of Colorado School of Medicine.

"Arts turns us from victims of our trauma to creators."

The research produced by Moss's research team has contributed to a body of knowledge that serves as the basis for the National Academy of Medicine (NAM)'s recognition that burnout is a significant issue affecting the delivery of health care.

Stressful working conditions

Burnout syndrome is characterized by high level of emotional exhaustion, depersonalization leading to increased cynicism, and feelings of a lack of personal accomplishment at work.

Driving these symptoms is an extraordinarily difficult work setting: critical care units where professionals unrelentingly see death, tragedy, and immense grief. This is especially evident during the recent COVID pandemic that is filling ICUs with critically ill patients.

"In a matter of a few days, nurses often go from talking to patients to putting them on life support and if the patient passes away performing their post mortem care without having the time and space to process the loss," said Moss.

The psychological distress that professionals encounter in that environment can result in symptoms of post-traumatic stress disorder (PTSD). In a study led by Moss, researchers found that PTSD numbers for critical care nurses were markedly increased and at levels that were higher than that reported by war veterans who have come back from Afghanistan and Iraq.

The increased rates of burnout syndrome and PTSD have severe consequences on clinicians and their work, resulting in reduced work efficiency and more frequent medical errors. In some cases, professionals develop a negative self-image and in the most shattering cases they commit suicide.

Reluctance and resistance

Initially, when Moss and colleagues would present their data showing burnout in nurses, they would encounter resistance. Providers denied they were burned out and community members would be less than sympathetic.

The medical professionals were afraid they would look weak, Moss said. While those outside the profession would dismiss burnout as whining. They would hear statements like "you choose this profession and you knew what it takes."

An improved understanding of the personal costs for patients and providers and the financial implications for hospitals and clinics prompted a re-evaluation of working conditions. ICU nurses have turnover rates of 17 percent to 20 percent per year. That churn adds costs for recruitment and limits investments.

Moss applied for a grant from the National Endowment for the Arts (NEA) in response to a 2018 call for applications. His proposal aimed to strengthen resilience among health care professionals who work in the critical care environment.

With the $150,000 awarded by the NEA, Moss and his colleagues established the Colorado Resiliency Arts Lab (CORAL) to create and then study a creative arts therapy program for critical care professionals. CORAL offers a safe space for health care professionals to express and process psychological distress through the arts.

Arts and collaboration

With creative arts therapy, medical professionals engage in a range of expression – visual art, music, dance, and creative writing – to identify, accept, and overcome psychological stress. Creative arts therapy provides ways for medical professionals to express their feelings, which they might otherwise contain or suppress.

The team at the Colorado Resiliency Arts Lab are Katherine Reed, LPC; Marc Moss, MD; Kate Cochran; Hillary Sinn, LPC; Mike Henry, MFA; Tony Edelblute, LPC; Dan Manzanares; and Kat Foley.

CORAL partners with the Ponzio Creative Arts Therapy Program at Children's Hospital Colorado on visual arts, music and dance therapy, and with Lighthouse Writers Workshop to provide access to creative writing therapy.

CORAL currently is recruiting ICU professionals for a clinical trial at the Lighthouse Writers Workshop in Denver to test the efficacy of four different modalities (creative arts, music, dance/movement, and writing) over a 12-week period.

The Lighthouse Writers Workshop was formed 24 years ago create a community for writers and encourage creative writing as an art form. Its mission now includes exploring literary art as a tool for emotional expression, especially for people facing difficult challenges, including patients with cancer diagnosis and youths from poor neighborhoods.

"When you take an experience that has pulled apart your sense of self and write it in a story that captures that event, it allows you to take control and demystify that experience," said Michael Henry, executive director at Lighthouse Writers Workshop. "There is abundant anecdotal evidence that these workshops help, but the lack of quantifiable data to prove it has been missing so far. This collaboration provides the missing link and that's been immensely exciting."

Henry designs the sessions to build up in intensity, starting with basic elements of good writing and assigning pieces like "describe your grandmother's kitchen" or "what's the story behind your name" to help participants develop a comfort zone. Then, the sessions progress to thematic topics like, "describe your best day at work" and "recount one of the most stressful days at work."

"The arts give permission for people to ease the pressure to constantly produce and then offer a vehicle for them to process difficult feelings and eventually transcend them into something beautiful," says Katherine Reed program manager at the Ponzio Creative Arts Therapy Program.

At Children's Hospital Colorado, the Ponzio Creative Arts Therapy is a part of psychiatric treatment for kids with eating disorders, autism, and Asperger syndrome.

During the past five years, Reed has received requests from hospital staff members to provide similar kinds of art therapy to address burnout, compassion fatigue, and to promote team building. In 2018, when Moss approached Reed to ask for help with his program, they realized working together they could have an even greater impact.

In 2019, Reed and her team did 36 hours of resilience building for groups all across the campus, serving 818 professionals in total.

Creative activities have included creating large murals using caps of medicine bottles that have been collected by the emergency department. Other groups have been "scrapbooking" filling blank books with images, ideas, words, crafts, or any medium they can fit. Ultimately, they are encouraged to share the images and use those as building blocks to express and process feelings.

"Arts turns us from victims of our trauma to creators," said Reed.

A persistent challenge for Moss and the team is that medical professionals are reluctant to take time out from their busy schedules to participate in the trial. It is difficult for critical care healthcare professionals to accept that burnout can also hit the best practitioners in the field and they are sometimes resistant to taking time for mental health care.

Eventually, the team hopes their work could lead to a studio space in a clinical setting where staff could go during breaks express themselves through creative arts. They would also like to provide evidence that having dedicated time in staff schedules for art and recreation will improve patient care and clinical performance.

Model Hearts and Virtual Reality

Inworks lab brings advanced technology to patient bedside

By Joseph Carrillo

Lorna Browne, MD

Lorna Browne, MD, holds an intricately detailed 3D printed model of a child's heart.

With each chamber and valve rendered in a rainbow of colors and translucency, it would be easy to mistake the anatomical model as a work of art. Just a few years ago, this type of model was unimaginable.

Now, such models are used by CU School of Medicine faculty at Children's Hospital Colorado to rethink approaches to pre-operative planning and to improve the quality of bedside care for patients and their families.

Such models are the result of decades of advancement in radiology scanning and more recent leaps in 3D printing. "It's a really exciting field," said Browne, who is professor of radiology at CU School of Medicine and a pediatric radiologist at Children's Hospital Colorado on the Anschutz Medical Campus. "There are so many technical advancements to be involved in."

At the cutting edge of this printing is Nick Jacobson and the Inworks prototyping lab, also located on the Anschutz Medical Campus in the Strauss Health Sciences Library. Inworks is an innovation initiative of the University of Colorado Denver | Anschutz Medical Campus, providing a home for creators, thinkers, designers, and makers. Drawing on experts from many disciplines, Inworks offers learning and teaching through making things that matter.

Browne offers another model, this one of an 18-month-year old's crisscross heart, a rare cardiac malformation characterized by crossing of the inflow streams of the two ventricles due to an apparent twisting of the heart about its long axis.

"As you can imagine, just seeing this in two dimensions, it's very hard to understand and figure out how to rearrange the blood vessels," she said, explaining the advantages that the physical model holds over a traditional computer model.

"You can move structures in a way you can't on just a screen, you can even practice the surgery by doing incisions," Browne said. With this tool in hand, medical professionals such as Browne are able to plan surgeries in a more tangible way than ever before and have a better understanding of how the patient may respond to the procedure.

Being able to manipulate a 1:1 replica of a patient's heart, before making a single incision, is an invaluable tool for any surgeon and an obvious advantage of this type of 3D printing.

What may not be so obvious is the advantage the tangible model has on doctor-patient relations.

"You can also show this to the patient's family, and the surgeon can say, 'This is what it looks like and this is what I'm going to do,' and that's a huge thing. It's an incredibly stressful situation having your child operated on."

James Joseph Thomas, MD

Jenny Zablah, MD, an assistant professor of pediatric cardiology at CU School of Medicine, agreed that the benefits of 3D printing are expansive. "It's complementing what we already know from the angiograms [and] from, the patient's perspective, it helps them understand their anatomy."

Zablah has broken new ground by taking the images produced by angiogram and printing 3D models in her office. These models serve to assist the medical team planning the operation and the families of patients, who might be feeling left in the dark when it comes to the specifics of the procedure.

When treating patients, especially children, trust in the doctor performing these medical procedures can drastically alter the experience for the medical professional and patient. 3D printed models can encourage and facilitate more effective dialogue between families and doctors, allowing all parties involved to better understand what procedures will be performed and what the outcomes might be.

"I process the images and print them right in my office. The printing usually takes about 24 hours," Zablah explained, "The patients are happy with seeing these models before the operation. It provides a nice memory or memento during a difficult time."

In addition to putting minds at ease, these models also reduce the time patients are exposed to radiation while undergoing imaging. By having a physical model that can be referenced repeatedly throughout pre-

operation planning, physicians are able to reduce the number of times an individual may need to undergo imaging procedures and in turn reduce the risk of repeated radiation exposure. In tandem with other technologies such as virtual reality, patients are receiving care that reduces the risk of complications.

As James Joseph Thomas, MD, an assistant professor of anesthesiology at CU School of Medicine and colleague of Browne and Zablah said, "Some of these cath lab procedures we could potentially do with no sedation or without general anesthesia, or with minimal sedation, because of the power of the distraction of virtual reality systems."

Anesthesia can change the physiology of the patient, which is then treated with more drugs, so having a tool like a VR system can lead to a reduction in the number of drugs a patient needs to take. Reducing the amount of drugs administered to a patient is a particularly optimal goal when that patient is a child and may be receiving multiple tests or procedures in a single day.

Children's Hospital Colorado has already seen wide success with virtual reality distraction, reducing the need for sedation and general anesthesia in some cases. The value of this is twofold as a calm and cooperative patient puts less pressure on medical staff, ensuring they are able to complete their tasks in the most effective way possible.

"A big part of introducing these kinds of technologies into the health care realm is creating experiences for doctors and patients [and] using this technology as a tool to improve our bedside manner," Thomas said.

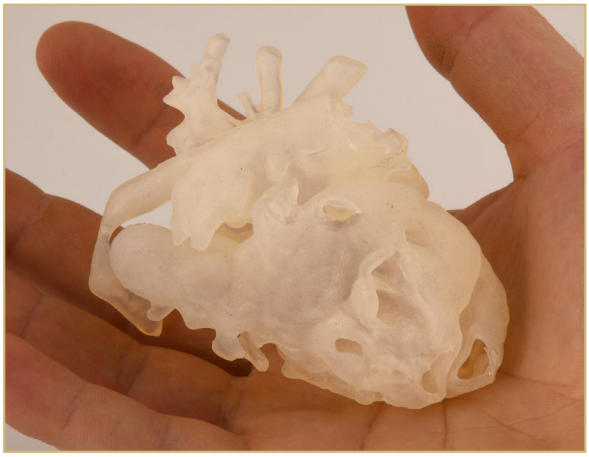
For Thomas, the advent of 3D printing is only one tool in closing the gap between doctor and patient understanding. Browne, Zablah, and Thomas hope to use advances in technology in tandem with 3D printed models to ease the minds of patients and family alike.

"We've been talking about some ideas of creating these 3D models in virtual reality, so it's just a file we can share with the family and they can take it home and potentially look at it in a 3D headset and share it with their family," said Thomas, "We're using these technologies as a tool to help capture [the patient's] attention and pull it away from this thing that may be causing them anxiety and stress."

Whether it is VR used to create calming distractions of the virtual or 3D printing to provide a tangible model that makes it easier to understand a procedure, the progression of technology is offering an array of solutions to medical obstacles.

"When you have a sick child, it's one of the worst things you can go through," said Thomas. "If you can, in any way, make that entire situation easier for the patient and their families, the impact that has on their lives is enormous. That's why we went into pediatrics: to try to make those difficult times better and easier."

"We all learn in different ways. Some of us are auditory learners, some of us are visual, some tactile."



Inworks lab's 3D models of hearts to improve patient care while making it easier to explain procedures to patients and their families.

Improving Care for Colorado

CU School of Medicine expands access to care statewide

By Mark Couch

The faculty members of the University of Colorado School of Medicine have expanded their outreach to communities throughout the state in the past three years with support from a program that provides federal Medicaid reimbursements for providing care.

Since receiving this support in 2017, University of Colorado School of Medicine providers, who served 122,000 Medicaid patients in the state fiscal year 2016-2017, served over 62,000 additional unique Medicaid members in the first two years of the program, which has enhanced access to primary and specialty services for this historically underserved population. CU faculty now provides care to about one-sixth of the state's total Medicaid enrollment.

With the expanded support, University of Colorado School of Medicine has established more than 60 projects across the state that are designed to increase access to primary and specialty care, promote evidence-based practices, expand access to underserved rural areas using telehealth, and enhance access to behavioral health services for the Medicaid population.

"Our approach has been to create programming that focuses not just on clinical needs of patients, but also aims to address the social determinants of health and patient barriers to care," said School of Medicine Dean John J. Reilly, MD. "Our goal has been to make sure Coloradans can remain healthy and that they have access to ways to improve their quality of life. The support we've received has been vital to that effort."

Some projects that receive support are specialty clinics, such as pulmonary and sleep medicine clinics in Grand Junction, Durango, and Cortez, and a student-run clinic in Colorado Springs that provided foot care to the homeless population. In other cases, the support is targeted to programs that build capacity within the health care workforce in local communities, such as ECHO Colorado, which offers innovative distance learning using online, live-video instruction. In 2019, ECHO, which stands for Extension for Community Health Outcomes, connected CU specialists with 570 participants in the state.

The School has also worked closely with state agencies to provide high quality care. The School partners with the Colorado Department of Health Care Policy and Financing to perform analytic projects on patient data to target better interventions and care for patients.

The School also provided continuity of care for those patients who rely on the Health Care Program for Children with Special Needs at six clinics that had been operated through 2018 by the Colorado Department of Public Health and Environment. With Medicaid supplemental funds, the School was able to assume operations at those locations and continue to provide uninterrupted care to patients and families who rely on obtaining those services closer to home.

The overall effort has had a profound impact on care by allowing patients to receive care in their home communities, saving patients a collective 160,000 miles in driving to metro Denver to receive medical care. The funding has created more than 100 jobs for care coordinators, social workers, nurse care managers, and school-based navigators, as well as supporting recruitment of highly specialized physicians in hard-to-recruit subspecialties.

Here are some projects that highlight the scope of what has been created or expanded and that show the range of patients who now have improved access to the high-quality care provided by CU faculty.

Opioid Addiction Care

Even though people with opioid addition were increasingly hospitalized, access to hospital medicine providers with expertise also in addiction treatment was limited.

To address this need for hospital-based physicians with specialized training in addiction treatment, the Department of Medicine Division

Over 60 Projects

are funded by Medicaid Supplemental Payments

Areas of Focus Include:

- Access to Primary Care
- Access to Specialty Services
- Advances in Telehealth
- Behavioral Health Services
- Investments in the Healthcare Workforce

of Hospital Medicine created a consult service of 11 internal medicine hospitalists who received, through this funding, training in identifying, treating, and supporting patients with substance abuse disorders. From October 2019 to December 2019, the group completed 286 consults.

The 11 hospitalists who were recruited into the addiction medicine training program participated in specialized training and are committed to taking the Addiction Medicine board exam. The training facilitates patients with substance abuse disorders beginning treatment for their addiction while they are in the hospital, rather than waiting for a referral after discharge.

In addition to the specialty training for hospitalists, the program also supports a dedicated social worker and peer recovery coach. Those care providers visited community treatment partners and clinics so that when patients are discharged from the hospital they can be enrolled in programs that provide appropriate care in an outpatient setting.

Children with Autism Spectrum Disorders

Colorado has had a long-established need to provide timely diagnosis and quality care for children with Medicaid who have developmental disabilities and autism spectrum disorders, particularly in rural, frontier, and urban underserved communities.

A program created in 2019 with supplemental Medicaid funding provides rural and frontier provider education opportunities that gives those providers the training needed to do evidence-based diagnoses and offer treatment for developmental disabilities and autism spectrum disorders. One example is training on how to administer the Screening Tool for Autism in Toddlers & Young Children. The training allows earlier intervention, which has been demonstrated to improve long-term outcomes for these children.

These training activities provide a support network that has enabled local primary care providers to identify children with developmental disabilities and autism spectrum disorders early and to then manage behavior. Providers in many Colorado communities, including Edwards, Rifle, Montrose, Grand Junction, Durango, Basalt, Fort Collins, Sterling, and Aspen have received the training.

By providing this training, families can stay in their home communities rather than commute to the Anschutz Medical Campus in Aurora. This model of care reduced a waitlist of 238 school-aged children by 81 percent over an 18-month period and participants from trained practices have a mean wait time reduction from 18 months to two months.

Functional Neurologic Disorders Clinic

The Functional Neurologic Disorders clinic was developed and expanded to provide more accurate diagnosis of non-epileptic seizure patients and provide them with an evidence-based treatment plan and toolkit for continued wellness.

About 25 percent of patients presenting with a seizure diagnosis have a functional neurologic disorder that is better managed through a multispecialty team led by neurologists and psychiatrists providing evidence-based behavioral health interventions. This group of patients has a high rate of using emergency departments for care, but with proper diagnosis and treatment, their reliance on higher-cost emergency room care is reduced.

With supplemental Medicaid funding, the program supports a multidisciplinary team that includes a full-time licensed clinical social worker who delivers direct clinical care. The team also performs community liaison work to care for patients in their primary care medical home and with outside behavioral health care as needed.

The clinic is one of only three such clinics in the western United States. The interventions by the clinic have demonstrated a 75 percent decrease in emergency department use, a 95 percent decrease in in-patient care, and a 91 percent decrease in imaging utilization after treatment.

Statewide Youth Suicide Prevention Initiative

The Colorado Statewide Youth Suicide Prevention Initiative was established to train individuals who work with children and youth on evidence-based approaches to suicide prevention.

This program engages key stakeholders to design and implement a pilot for establishing a pediatric care pathway that will identify and link youth at risk of suicide to appropriate care.

In 2019, a training associate, content developer, and program evaluator were hired to carry out program development and implementation. This initiative will train those individuals across the state who have contact with nearly all young people in the state. Fully implemented, it is estimated that support will be available to cover 95 percent of the 450,000 children ages 12 years to 17 years in the state of Colorado.

Sickle Cell Treatment and Research Center

The Sickle Cell Treatment and Research Center was established by state legislation in the 1970s with a mission to facilitate health care for those living with sickle cell disease, provide education to providers and the community about sickle cell disease, and to conduct research.

Sickle cell disease is a genetic disorder caused by an inherited abnormality of hemoglobin, the oxygen-carrying protein in red blood cells. The disease is characterized by anemia, acute complications that can become rapidly life threatening, and the development of chronic organ damage.

Limited funding had restricted completion of this mission in some parts of Colorado, so the effort had focused mostly within the service area of the School of Medicine's partner hospitals on the Anschutz Medical Campus. In recent years, the center faced a growing need from patients in the San Luis Valley in southern Colorado.

With this support, the center was able to develop and sustain a coordinated statewide program offering support to providers in the emergency department, primary care, specialty care, and hospital settings. With improved communication, clinical management guidance, and education across all healthcare systems in Colorado, individuals can seek care where they live from providers who have access to the information necessary to provide care.

New Clinic is 'Bigger than What's in These Four Walls'

CU partners with Salud to provide care to Aurora residents

By Mark Couch

The University of Colorado School of Medicine joined Salud Family Health Centers in February to celebrate the grand opening of a new federally qualified health center in Aurora that will serve community residents who depend on Medicaid for health insurance.

The clinic is the initial step in a larger partnership between CU and Salud to bring options for healthier living to Aurora residents. Salud has purchased 27 acres on the southeast corner of Airport Boulevard and East Colfax Avenue, where Salud plans to develop the Aurora Community Health Commons.

John Santistevan, president and CEO of Salud, said the long-term goal is to provide a site for Aurora residents that promotes healthy living in addition to providing medical care.

"We're looking at this as a bigger project than what's in these four walls," Santistevan said at the ribbon-cutting ceremony for the clinic on Sable. "In three years, we're going to have a commons campus that will be addressing a lot of the social determinants of health."

At the commons location, Salud plans provide housing, an urban farm and healthy food options, exercise equipment, job training, and many other services.

Salud is a private nonprofit that was established 50 years ago in Fort Lupton and now has 13 clinics, 11 school sites, and a mobile unit in Colorado to provide medical, dental, pharmacy, and behavioral health services. Last year, Salud served 82,000 patients who made 360,000 visits to Salud clinics.

CU School of Medicine Dean John Reilly, MD, (second from the left) and Senior Associate Dean for Clinical Affairs Anne Fuhlbrigge, MD, (fourth from the right) joined community leaders to celebrate the opening of a new federally qualified health center in Aurora.

"The vision was really originated by Dean John Reilly. We would not be here in Aurora if the CU School of Medicine did not invite us and it really was the Dean's vision to do this," Santistevan said. "We've been working on this project for two years. It's been a lot of planning and a lot of work, and on January 13 we saw our first patient here."

John Reilly, Jr., MD, dean of the CU School of Medicine, said the partnership with Salud is a natural extension of previous work the School and Salud have done together. In Fort Morgan, there is a family medicine residency program at the Salud clinic there. Some CU medical students also complete clinical training rotations at Salud clinics.

The Aurora project aims to address a significant need for improve access to primary care in the neighborhoods surrounding the Anschutz Medical Campus. An analysis of three ZIP codes - 80010, 80011, and 80012 - found that an estimated 48,000 people did not have primary care providers.

"Even though Medicaid expansion has provided them with insurance coverage, it does not necessarily provide them good access to primary care," said Reilly. "So it's a real privilege for us to take a leap with a partner."

CU faculty members already provide care to patients who depend on Medicaid, with the School's medical practice caring for about 160,000 patients with Medicaid, with children accounting for about 100,000 of them.

"We think we can accomplish a few things, improve access to primary care for the population right around our campus, our neighbors and friends. We're going to co-locate specialty care right on [Aurora Community Health Commons]. ... It's going to be the stop to get their medical needs met."

Anne Fuhlbrigge, MD, senior associate dean for clinical affairs, said the partnership offers a new opportunity to expand the interdisciplinary team-based training.

"We have representatives from all the different disciplines and all the different schools that want to be part of this," she said. "Even off-campus groups are interested. The College of Architecture and Planning, which is on the downtown CU campus, wants to be involved in helping to make the commons a focus of health, not just health care."

In addition to providing multidisciplinary care, the commons will provide an opportunity for training future providers to work together.

"We want to think about the interdisciplinary, inter-professional nature of the care we provide on that campus and how we teach the next generation of providers who come to that campus to learn how to provide care in a true team-based approach."

Innovative Palliative Care Fellowship Program

CU offers online advanced training for mid-career providers

Amos Bailey, MD

By Mark Couch

The University of Colorado School of Medicine is offering an innovative non-residential fellowship program to train physician specialists in hospice and palliative medicine.

Beginning this summer, six mid-career physicians will begin training in the Hospice and Palliative Medicine Fellowship demonstration project.

"There is a serious and worsening shortage of palliative care specialists in all disciplines in healthcare, but the shortage of physicians is a particular difficult problem," said Amos Bailey, MD, professor of medicine and director of the University of Colorado Master of Science in Palliative Care program.

"Currently, there are 360-380 physicians training to be hospice and palliative medicine specialists each year, but we need several times this number to meet the forecasted need with an aging population."

Palliative care is provided by an interdisciplinary team that works with the patient, family caregiver, and medical providers to offer physical, social, emotional, and practical support, according to the National Institute on Aging. In palliative care, curative and disease-modifying treatments are provided and palliative care providers assist with symptom management and psycho-social-spiritual support to provide the best quality of life.

Over time, palliative care providers work with patient and families who may find that ongoing treatments are too burdensome with limited benefits. Some patients may transition to hospice care when that is consistent with their treatment preferences. Hospice is an approach that offers comprehensive comfort care to the patient and family in the final months of a life.

"We've found that physicians are often drawn to hospice and palliative care in mid-career, when they've witnessed how their patients and family caregivers could benefit," Bailey said. "At this point in their professional careers, though, it is often difficult or even impossible to leave their family, community, and medical practice to relocate for advanced fellowship training in the critical discipline."

As innovators in medical education, the University of Colorado Anschutz Medical Campus started the country's first Master of Science degree program in palliative care in 2016. This interprofessional program enables physicians, nurses, advanced practice providers, social workers, spiritual care providers, psychologists, and others to advance their knowledge and skills through a primarily online format. The program participants attend three on-campus weekend intensive sessions that focus on communication training.

"This program has been ideal for mid-career providers because it allows them train as palliative care specialists while remaining in their home community and practice," Bailey said.

Furman McDonald, MD, MPH, senior vice president for academic and medical affairs for the American Board of Internal Medicine, encouraged Bailey to develop an Advancing Innovation in Residency Education (AIRE) proposal that would allow physicians who complete the CU Master of Science in Palliative Care program to become board certified in Hospice and Palliative Medicine. Board certification provides a set of qualifications for practitioners and allows for oversight by peers who can ensure high standards of care.

> "This program, when successful, holds great promise as an alternative pathway for mid-career physicians to enter the field of hospice and palliative medicine."

Working with Eric Holmboe, MD, chief research, milestone development, and evaluation officer at the Accreditation Council for Graduate Medical Education, Bailey and the CU team developed a program of online hospice and palliative medicine seminars. They also created an online Palliative Medicine Clinical Portfolio which together with the existing Master of Science in Palliative Care degree course work will meet all Hospice and Palliative Medicine Fellowship requirements over a two-year period.

"This program, when successful, holds great promise as an alternative pathway for mid-career physicians to enter the field of hospice and palliative medicine," Bailey said. "We have a growing workforce need. This model could also be used to support the development of specialists in other areas like geriatric medicine or addiction medicine where career development is necessary to provide the best care for patients, but is often impractical for providers who cannot forego professional and personal responsibilities in mid-life to relocate to another community for a residential fellowship program."

Leadership, Curiosity, Commitment

School of Medicine updates curriculum for medical students

By Mark Couch

A good medical education is the journey of a lifetime.

Beginning in 2021, medical students at the University of Colorado will embark on "The Trek," a redesigned curriculum that aims to strengthen the connections student make as they learn to become physicians.

Those connections – between science and care, between provider and patient, between mentor and trainee – are intended to instill the knowledge and skills that students need to become accomplished physician-leaders while cultivating the personal characteristics that will contribute to ongoing success throughout their careers.

"If you look around our campus and at medicine from a big perspective, the way we deliver care is rapidly transforming," said Shanta Zimmer, MD, senior associate dean for education and professor of medicine. "The way we approach the science of medicine is also rapidly transforming."

And as a result, the way we teach medicine needs to transform, Zimmer said. The programming for a medical school education will still require the fundamentals. There will be no skipping anatomy. Students still need to know how to do a physical exam. But there will be an emphasis on learning in a new way.

For example, students will continue to study foundational science during their first year, but advanced understanding of basic sciences will be connected later in the learning process so that it is linked more directly to clinical experiences.

That is just one part of the redesigned curriculum known as the Trek.

"The students named it," Zimmer said. "We had a contest. Michigan has the branches and the tree. UCSF has the bridges curriculum, which is kind of cool. A lot of places have done that in order to mark the transition or the launch of something new and innovative. So we went to our students and said, 'What do you want this to be called?'"

The Trek

That first year of the Trek, which includes foundational science and clinical skills training, is akin to crossing the Plains.

Naming the program wasn't the students' only role. Students joined faculty, staff, and community leaders in helping craft the redesigned curriculum. Eighty-three students wrote essays explaining why they wanted to participate.

The curriculum update effort began in October 2017 with a kick-off retreat on campus that called on the medical school community to dream big and work hard on a project that will have significant impact on the future of the School.

"I told them to do a blue-sky approach, but it had to be on this planet," Zimmer said. "That was the only restriction."

Twenty-five committees were formed, involving more than 200 people, to review best practices and curriculum reform efforts at other medical schools, and to evaluate CU's current program.

When the School of Medicine's accrediting body in 2017 completed its thorough analysis, there were no citations related to educational programming. So why change it? The process of updating the curriculum is an important exercise in maintaining relevance as the demands of providing care grow and the methods of teaching and learning change.

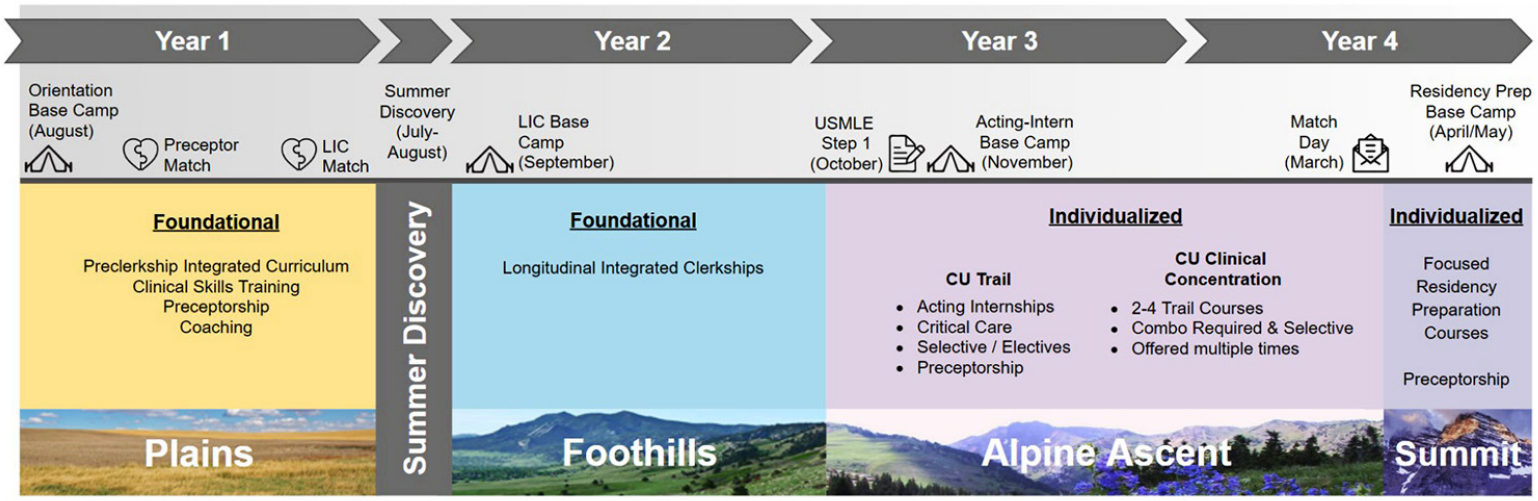
While some subjects related to medical education are constant, the context is constantly changing. As a result, it's necessary to pose questions about how the health care system works, about society and its impact on health, about how technology can improve the quality of care.

Zimmer listed a series of questions shaping how medical educators approach the task of teaching the next generation of physicians: "Is it going to be value-based care? Are we going to have a single-payer system one day? What does that look like from a technology perspective? Where does AI fit in? What about telemedicine and telehealth? Then there are the big data components. ... I think it makes good sense that as science and health care delivery are changing, we're going to have to change medical education."

If you ask again tomorrow about what questions should be asked, the questions will certainly change. The goal is to train physicians to be ready to address those changes and to continue to learn long after they've left school.

"I've started talking to applicants about coming into a school that has a curriculum revision process like the one we have going on, and what I've told them is, 'Don't come here if you don't want to learn how to learn and you're not going to be flexible with the things that you are learning,'" Zimmer said. "If something new happens in terms of CAR-T cells for treatment of leukemias or breast cancer down the line, then you're going to have to learn about that as a practicing physician. You aren't going to be able to say, 'They didn't teach that to me in medical school so I'm not going to care about it.'

"We're creating people who like to learn all the time rather than creating people who have a set of knowledge. And I am happy that the Dean has given us the latitude to say that's what we want to do and that's why curiosity is one of the major pillars of the new curriculum."



Leadership, Curiosity, and Commitment

The guideposts for the Trek curriculum are Leadership, Curiosity, and Commitment. Those are the values that all medical students should bring and strengthen as they earn their degree.

"Leadership was the one the Dean felt very strongly about because interdisciplinary teams are the way of medicine now," Zimmer said.

Working together with other providers has been crucial component of medical education on the Anschutz Medical Campus for many years, thanks to interprofessional education programming and through a specialty track known as LEADS (Leadership Education Advocacy Development Scholarship).

Now, rather than have leadership as a focus of a track for some medical students, the redesigned curriculum will emphasize leadership throughout the learning process for every medical student.

"Business schools know how to train around leadership, the military knows how to train around leadership, even in law schools they have courses around leadership," Zimmer said, "and in medicine, we've just kind of said, 'Well, you're going to be a leader,' but we don't do anything specifically to train you. So we're going to be more deliberate about the importance of that."

Commitment recognizes that being a physician requires persistence and passion, resilience and resourcefulness. To succeed, there will be times that personal sacrifices are necessary.

Longitudinal integrated clerkships

Such values are often learned by example, so medical students will be taught by strong, positive role models – clinicians, investigators, advocates – in longitudinal relationships. They will also do clinical training in longitudinal integrated clerkships, where they participate in comprehensive care of patients over time, engage in continuity relationships with preceptors and evaluators, and meet core clinical competencies across multiple disciplines simultaneously.

"I think that before we started this process that's one of the most controversial decisions that we were going to make, which was how are we going to teach students 'the doctoring part' that you think about in a medical school," Zimmer said.

Longitudinal integrated clerkships, or LICs, are an ideal way to teach because it allows for mentoring relationships between faculty and students, ongoing connections between students and patients, and peer partnerships between small groups of students.

The School of Medicine has experience with LICs at Denver Health, at the School's branch in Colorado Springs, and in rural settings and the Rocky Mountain Regional VA Medical Center. This spring, the School is launching a LIC in northern Colorado that will be based at the School's branch in Fort Collins that is opening in partnership with Colorado State University.

The reason for pursuing a curriculum focused on LICs is the results they get. According to the School's data, students in the LICs do as well as or better than their peers in the Match, on their rotations, in their residency programs, based on feedback from program directors, and on licensing exams.

"If you were to read the literature about LICs nationally, that's true," Zimmer said. "It also leaves students with a higher sense of compassion and commitment. If I am going to have the opportunity to do something that's evidence-based to change our curriculum, this is the one that has the most evidence behind it in terms of making sense."

In Trek-speak, the LICs are when the students travel through the Foothills of their educational journey. The experience remains foundational and is required before they can ascend to the individualized training that comes next in the Alpine Ascent. At the end of their fourth year, with elevated skills and knowledge, students will be ready for the Summit, which are individualized focused residency preparation courses.

With that hard-won perspective, the curriculum redesign team expects that students will be equipped to address the needs of patients and their communities in a new way. Rather than teach medical students a hospital-centric health systems approach, they hope new physicians will be looking for ways to provide the kind of care that the patients want to see.

"Patients are people, not a system" Zimmer said. "They like their schools, their places of work, their communities, their parks, their environment, and wouldn't it nice to have our students right out of the gate focus on patients not where they're sick, but where they're healthy.

"Our curriculum is going to be taught from the systems that the community values, and that's where you learn problem-solving, evidence-based medicine, patient-centered care, and you can learn that through the system of the community.

Osseointegration surgery offers hope for better, faster, stronger life

UCHealth patient waited 38 years to walk properly again

By Todd Neff

Janet Corral, 53, stands on the mobility platform at UCHealth Physical Therapy and Rehabilitation Clinic – Stapleton. She unweights herself with her hands on the stainless-steel rails running the length of the apparatus. Her black New Balances rise and fall as she slowly and gingerly walks in place. Guy Lev, the physical therapist who leads the rehab clinic, observes and corrects. He's focusing on her posture, and so is a visitor who, like Lev, has a doctorate in physical therapy. Ruud Leijendekkers, in from Radboud University Medical Center in the Netherlands, has long experience in helping leg amputees walk again – as does Lev. Corral, though, is no ordinary above-the-knee amputee.

The black shoe and matching sock on her left leg gives way to the metal, carbon fiber, and plastic of a prosthetic. Its trim chocolate-brown calf yields to a metallic knee joint; above that shines a short stainless-steel post. The distinguishing factor with Corral's robotic augmentation resides just above this. The post does not disappear into the usual bucket accommodating the residual limb – the bucket's technically called an ischial containment socket – but rather connects to a metallic rod that disappears into her upper thigh.

Janet Corral works with physical therapist Lee Bernhardt at UCHealth Physical Therapy and Rehabilitation Clinic – Stapleton nine days after her second osseointegration surgery. Photo by Cyrus McCrimmon for UCHealth.

Janet Corral walks on the artificial turf outside the house she rented for three weeks after her second surgery. It's a good place to practice walking on uneven surfaces, she says. Photo by Cyrus McCrimmon for UCHealth.

Osseointegration surgery

Six days before, on Nov. 5 at UCHealth University of Colorado Hospital on the Anschutz Medical Campus, University of Colorado School of Medicine orthopedic trauma surgeon Jason Stoneback, MD, connected the rod now disappearing into her leg to a titanium implant he had installed in Corral's femur two months before that. It's called osseointegration, and it promises to free Corral from the pain and limitations of her standard socket prosthesis.

Corral had been a student of the procedure for years before reaching out to Stoneback, who leads UCHealth's Limb Restoration Program and is now one of the few surgeons on the planet doing osseointegration surgeries. Most of the others are overseas – hence Leijendekkers' presence here in Denver's Stapleton neighborhood. The Dutchman notices Corral leaning forward slightly more than he would like.

"Imagine walls in front of you and behind you," he says, gently repositioning a hip and a shoulder.

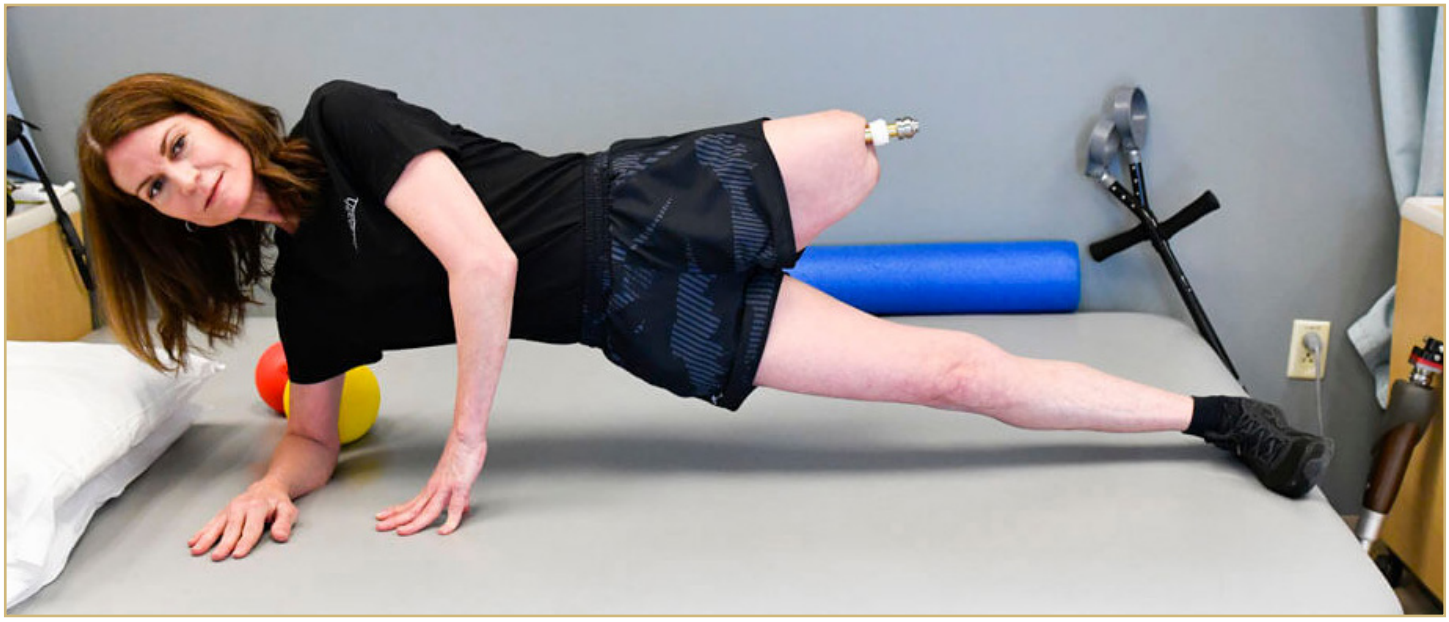
Corral does so, checking her own form in a full-length mirror someone has tolled to the end of the apparatus. For 38 years she has walked with a socket prosthesis; now she must unlearn what kept her vertical and rebuild withered muscle. She continues to lift alternating legs to the two physical therapists' satisfaction. She may be going nowhere at the moment, but she has already come a very long way.

Cuba, cancer

Corral was too young to remember her father secretly building a raft of old pallet boards in their backyard near Cuba's southern coast, or the risky open-ocean voyage she took with her parents and four siblings to Guantanamo Bay, where the family sought political asylum in 1968. They ended up in Miami, where they became part of a vibrant Cuban-American community. The kids grew and thrived.

In 1981, Corral was a freshman track standout at St. Brendan High School in Miami. She had already broken the school high-jump record when nagging pain in her left leg led her to a doctor. The diagnosis was a shock: she had bone cancer. It would be, as she put it, "my leg or my life."

They amputated mid-thigh, and Corral soon learned what essentially everyone who has ever worn a socket prosthesis well knows: they are generally uncomfortable and often painful, whether the prosthesis itself is wooden – as Corral's first one was – or the microchip-driven robotic wonder of a C-Leg. The residual limb swells or contracts with temperature, hydration, the maturation of the limb, weight gain or loss, and other factors. Miami's humidity made the connection between leg and socket so slippery that it made it hard to keep it on for more than an hour or so – and ultimately led Corral to relocate to California's drier climate. She developed bone spurs at the end of her residual limb, which stabbed with each step, and sebaceous cysts in the upper thigh from being sheathed in a suffocating suction cup. Like many other amputees, she avoided walking except when she had to. But comfort isn't the only problem with socket prosthetics.



Janet Corral's rehab includes core-strengthening work to boost the strength of the muscles she'll need to walk properly. Photo by Cyrus McCrimmon for UCHealth.

A natural limb has firm connections – bones and cartilage – all through the kinetic chain. The residual limb of an amputee, in contrast, has the thick padding of muscle, fat and skin at its terminus. Below that are soft materials such as fabric and silicone liners in the socket itself –all needed to make wearing the prosthesis tolerable. The result is a mushy interface between human limb and prosthetic leg, making for a sloppy, unwieldy, unresponsive connection. It makes the act of walking like playing piano with ski gloves on or giving a speech with a mouth full of peanut butter.

When Corral met another amputee who walked easily and comfortably after osseointegration she began searching for the surgery.

"I was blown away when I saw his robotic setup and immediately knew I wanted it too," Corral says.

Teeth and much more

Osseointegration has an interesting history. It was pioneered in Sweden where a physician recognized the ability of the human body to grow bone into the porous surfaces of titanium implants and applied the insight to dentistry. All those who chew with the popular, superior alternative to dentures owe a debt of gratitude to this insight.

The technology was then carried from the mouth to the limbs. In 1990, the first osseointegration surgery was performed in Sweden. A few others in Europe, Australia and elsewhere have since followed. In Australia, more than 500 osseointegration surgeries have been done. The more Corral read about osseointegration, the more she was drawn to the idea of doing it. Yes, the initial surgery was equivalent to, as she put it, "another amputation," and the idea of a metal post forever poking out of her thigh took some getting used to, and the recovery and rehabilitation would take months. But once she was through it, she would be able to walk for miles with a normal gait, without pain, with extraordinary control, and with vastly improved proprioception – the ability to feel and thus react to what she's walking on.

As an orthopedic trauma and limb-restoration specialist, Stoneback was in the rare position of regularly working with amputees – he knew their challenges well – and having developed the specialized surgical expertise upon which to build an osseointegration-surgery practice.

The surgery, which takes perhaps two hours, requires extensive training and experience along with a well-trained team to support patient recovery. It is very similar to, say, one required to put the victim of a serious auto accident back together – another Stoneback specialty. Osseointegration shares its highly exacting nature with that of limb restoration surgery. The surgeon must understand the quality of the residual limb's bone, different implant and techniques available, how much of the bone to remove to ensure the best fit, how much titanium one should implant for an optimal performance, how much soft tissue to leave in place, and more.

The complexity doesn't abate after surgery. The angles of the attached prosthesis must be precisely calibrated and the limb itself adjusted for a perfect fit. If not, the patient risks back pain and long-term joint damage above the prosthesis. As patients' gait changes with increasing strength or other factors, prosthetists must make adjustments over time. Patients must receive specialized, intense physical therapy, as well, and the team must have the resources to screen patients (among many other criteria, those who aren't good candidates for major surgery can't receive orthopedic osseointegration).

A surgeon's quest

In early 2017, Stoneback set off on a journey of his own – a quest to bring osseointegration to Colorado. He met and trained with world

leaders in osseointegration surgery; he trained on the procedure in the Netherlands and visited Walter Reed National Military Medical Center; and he organized a team including himself, a nurse navigator, a psychologist, Lev and other physical therapists, and the highly regarded Denver prosthetist Christopher Hoyt.

He got buy-in from CU and UCHealth administrators. His team filtered through dozens of applications that rolled in from all over the country and beyond. And in September, Stoneback did the first of seven osseointegration surgeries on a handful of patients – Janet Corral among them.

Corral's sister Jacqueline Corral flew in from her home in Key Lago, Fla., and would stay with her from the second surgery – a 15-minute outpatient procedure to attach the stoma (which would protrude from her leg and anchor the prosthesis) to the titanium implant now firmly enmeshed into her femur – until Nov. 27. Filling that time would be three weeks of daily rehabilitation in Stapleton plus additional rehab at the Airbnb.

"It's always been miserable living with the prosthetic leg – always an issue, day after day," Jacqueline says. "I see her happier now. She knows that the future is going to be what she's been working towards for a long time."

Better, faster, stronger

Nine days later, Corral is back in Stapleton for rehab. She and Jacqueline wear matching black T-shirts Corral designed – there's a small UCHealth logo on the front and #Robotajanet on the back. Her Instagram and Facebook sites host a growing trove of stories about osseointegration experiences. UCHealth physical therapist Lee Bernhardt leads her exercises today; the Dutch advisors are back in Europe.

She still uses forearm crutches – and will for weeks yet – but she moves faster now, with more deliberate, speedier motions and no hint of the tentativeness evident just a few days ago. She stands on a three-inch-thick, squishy-blue foam square designed to challenge her balance. Bernhardt hands her a 2.2-pound soft-rubber ball and has her lift it with her arm straight out, then to the side. Her biological right leg quivers in constant adjustment as she does; her thigh and core muscles are doing the same, though invisibly, on the robotic side.

"Oh, boy, this is not easy," Corral says.

She does a few other exercises in the confines of the mobility platform and then grabs her forearm crutches. Out in the room, back and forth she walks, studying her ambulation in a mirror at the far end of her 10-yard trip. For the first time in 38 years, she can feel with each step that the surface is tile, carpet, gravel, or snow. "I can feel it all," she says.

Her sister has seen the progress, too.

"The pain's gone. She seems more confident now," Jacqueline says. "It's all so new."

Lev passes through. "She's doing great," he remarks.

"You've got the mechanics down – can you go a little faster?" Bernhard asks. "Like you're going somewhere?"

Corral picks up the pace to that of a window-shopping stroll. The crutches seem mainly for balance. She has come so far – and she is, without a doubt, going somewhere.

This article was originally published in UCHealth Today on Feb. 3, 2020.

Osseointegration provides a direct connection between Janet Corral's C-Leg and her femur. Photo by Cyrus McCrimmon for UCHealth.

Building a Team, Not Just a Building

Hospital leader receives life-saving care after stroke at work

By Molly Blake

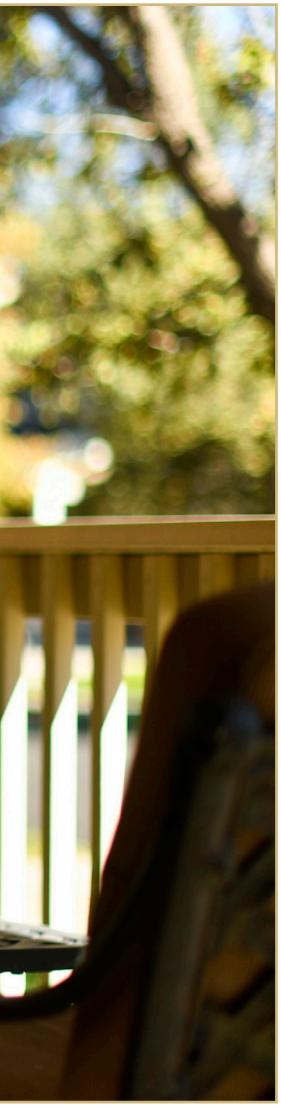
Jerry Oksner is recovering after suffering a debilitating stroke at the hospital where he worked. Colleagues became caretakers and saved his life. Photos of Oksner by Cyrus McCrimmon for UCHealth.

It was 2:15 a.m. and Jerry Oksner was wide awake, lying in his hospital bed.

He looked down at the non-responsive arm next to his body. It was his arm no doubt, but it was as if the limp, pale skin and bones were a child's toy box castoff and not his own strong, capable hand.

"All I wanted to do was put the puppet on and move it," said Oksner, who was then in the rehabilitation and therapy unit at UCHealth University of Colorado Hospital on the Anschutz Medical Campus.

He focused, trying to will his right arm to budge and, just like that, "I moved my wrist," he said, happily recounting the memory.



"At 2:17 a.m., I could wiggle my big toe."

"Here it was, the middle of the night and I couldn't tell my family what was happening," said Oksner.

Just 15 days earlier, Oksner was driving toward UCHealth Highlands Ranch Hospital, where he is the director of facilities management. His nostrils and lips began to feel "tingly," Oksner said.

"I thought I maybe had food poisoning or some kind of allergic reaction from lunch."

By the time Oksner arrived at the hospital, the 57-year old knew something wasn't right. He cautiously made his way down the hospital's gleaming, cream colored hallways, rounded a corner and entered his office. As he had many times before, he settled in among the architectural and engineering drawings and the giant sticky notes detailing the hospital's to-do list: review elevator timing, lead a window-cleaning meeting, visit the building's structural crawlspace, and investigate current water pressure. After all, the hospital had opened on June 18, barely a month earlier.

When he sat down in the chair at his small round work table, he recalled thinking that his chair was broken. His world tilted.

"I couldn't move," Oksner said. "I heard a knock at my door and I couldn't speak."

'Divine Intervention'

David Leslie, then vice president of operations for Highlands Ranch Hospital, was walking back to the hospital after lunch and decided to call Oksner and ask if the two could briefly meet. Not five minutes later, Leslie peered through the door's narrow window and knocked. The door was locked but Leslie could see Oksner seated at his desk.

"I assumed he was on the phone so I used my master key to let myself in," said Leslie who glanced at his friend's face. Oksner was trying to talk but his speech was garbled, he had a confused look on his face, and he was slumped to one side.

"It was a stroke, I knew it right away," said Leslie. "I also knew there was a wheelchair just around the corner. I ran out of the office, grabbed it and got knees to knees with Jerry. I hoisted him up into the chair and started pushing him as fast as I could down the hall toward the Emergency Department."

Leslie is a self-described emotional guy. He gets choked up pretty easily, but in the next moment he could chortle buoyantly, almost like a kid giggling at a knock-knock joke.

"Man, those wheelchairs can sure handle corners well," he said laughing.

Brandon Pope, MD, a neurohospitalist and assistant professor of neurology at the University of Colorado School of Medicine, happened to be rounding in the ER on his day off, when Leslie charged past, pushing the wheelchair.

"When he said he had a stroke patient, I thought he was kidding," said Pope.

"He's right here," Leslie said breathlessly, pointing to the man in the chair.

Leslie, a nurse with two-plus decades of experience, appreciates the astonishing power of modern medicine. And yet, he says, "that day there was definitely an element of divine intervention.

"The fact that I showed up in his office when I did, the window in the door, the wheelchair, and a top-notch neurology guy just standing there at that moment on his day off.

"I mean, it's hard to see it any other way because too many things aligned in the most perfect way."

Brandon Pope, MD, assistant professor of neurology, happened to be in the hospital on his day off checking on patients when a hospital administrator suffered a stroke

The 'Beverly Hills' of the Brain

Oksner had suffered what's known as a "lacunar stroke." This type of stroke occurs when arteries that carry blood to the brain get blocked. Oksner's blockage occurred in the "pons region." Latin for bridge,

the pons area is small but critical. Functions including coordination, strength, sensation and speech all travel from the brain stem to the brain cortex on fibers that bundle together and flow through the pons.

Pope said the pons is like Beverly Hills.

"It's a small area and real estate is expensive so when something in that area gets damaged, it will be noticed," said Pope.

With strokes, time is your enemy.

"For the most part, these kinds of strokes go from zero to 100 very quickly," said Pope. "What Jerry felt – the tingling – was most likely an early symptom."

The team administered the National Institute of Health's stroke scale to measure the severity and help determine treatment. Later stroke experts use the scale to quantify a patient's improvement.

The higher the score, the more severe the stroke.

Oksner scored high.

Opening Day Prep

Since August 2018, Oksner worked countless hours at Highlands Ranch Hospital. He knows every inch of its 462,000 square feet. From installation of carpets and floors to elevator inspections and security testing, Oksner was fond of saying, "we turned a construction site into a hospital."

All that work meant long hours away from home, which sometimes concerned Jerry's wife, Judy.

The Oksners are empty nesters and Judy longed to enjoy some spontaneity, like occasionally battling for the top score on the vintage yellow pinball machine in their living room. She was especially looking forward to a weekend getaway once the hospital was open and running smoothly.

But Oksner loved his job and the idea that with each finishing touch – a crisp, clean sheet snapped onto a bed or testing the life-saving overhead paging system – the Highlands Ranch Hospital team would be closer to providing extraordinary care to its patients. Soon the community would benefit from a world-class facility staffed with talented professionals.

It's unusual to open a brand-new hospital – and to have the chance to see the structure come alive as staff members bonded before the first patients arrived. Employees marked countless firsts: the inaugural, symbolic shovelful of dirt, the first new baby born, and the first ER patient.

Unbelievably, Jerry Oksner became the first to be treated in the hospital for a stroke.

From Colleagues to Caregivers

Jennette Bergstrom, chief nursing officer for Highlands Ranch Hospital, her voice shaky, barely holds back tears when she describes the moment she realized her friend and colleague was in her ER.

She remembers holding Leslie's hand while Oksner lay in the trauma bed, pale and sweating. She remembers thinking about the team who work for Oksner and the way he intently listens in their meetings, his shoulders hunched slightly. She remembered the time he helped her to her car during a torrential rain squall, umbrella protesting in the lashing wind. He even swooped down to fetch her shoe from a muddy puddle.

"Seeing Jerry in our trauma room hit home, but I had such confidence in the team and their professionalism," Bergstrom said.

Jerry Oksner, who suffered a stroke in the hospital he helped build and open, plays pinball on a vintage machine he and his wife own.

Indeed. It took just 24 minutes for the team to administer tissue plasminogen activator (tPA), a clot busting medication which significantly improves functional recovery for people suffering from certain types of strokes.

Chelsea Carlson, Oksner's ICU nurse, acknowledged that the mental wall she usually puts up, the one that keeps her head in the game when treating a sick patient, threatened to crumble when she realized the patient was her friend. The two worked side-by-side during comprehensive simulations of essential procedures and systems.

"Being a patient gave me unique perspective."

Highlands Ranch Hospital staff practiced treating mock patients with illnesses like heart attacks, broken collar bones, burns, cuts and of course, strokes. Oksner attended many of the rehearsals, scratching building-related notes on a tiny, spiral notepad. Like his coworkers, Oksner wanted to be sure the building's complex systems were ready for any medical emergency. Like a prop in a theater production, the building plays an unheralded yet vital role.

"It's easy for nurses and docs to just assume that monitors will work and there will be hot water," said Carlson. "Jerry and his team made sure they did, every time."

Jerry 2.0

The stroke affected Oksner's right arm and leg, leaving that entire side immobile. It was difficult to sit up, cut his food, speak clearly, and impossible to maintain his balance.

Stroke survivor Jerry Oksner is recovering after having suffered a stroke at UCHealth Highlands Ranch Hospital. Thanks to quick care, Jerry is recovering. Here, he goes for a walk in his neighborhood with his wife, Judy.

Treating a colleague in your own medical facility is rare, said Kathy Shockley, rehab services supervisor. "It's humbling, too, to suddenly rely on your coworkers to stand or toilet and yet Jerry was kind, gracious and vulnerable."

"Being a patient," said Oksner, "gave me unique perspective."

"Having a stroke isn't the way I would have chosen to find out what it's like to be on the receiving end of extraordinary care but I did."

And during those four days in the ICU, Judy came to understand how her husband had helped create more than a building filled with sophisticated equipment. He had helped shape a culture of collaboration and compassion among his co-workers. She could see the staff's unwavering commitment to caring for others only deepened during long hours at the hospital. Camaraderie shone brightly on July 22 and during the days that followed.

"We had so many visitors," Judy said. "I would grab a soda in the cafeteria and the cashier would ask about Jerry."

That's not to say Oksner took his work hat off entirely. While lying in bed, he made mental notes about a wall scuff that needed a touchup and adjustments to the room's mechanical equipment. Diane Cookson, president and CEO of Highlands Ranch Hospital, told Oksner his job would be there when he was ready to return.

This article was originally published in UCHealth Today on Nov. 20, 2019.

ALUMNI CORNER

A Letter from the President

Dear Fellow Alumni:

It has been an honor to serve as the Medical Alumni Association president this past year. Our association continues to generously give back and engage with the University of Colorado School of Medicine. I am excited to share some of the ways that our alumni have contributed since our last publication:

- Through the HOST (**H**elp **O**ur **S**tudents **T**ravel) program, 115 alumni welcomed into their homes fourth-year medical students traveling out-of-state for residency interviews.
- We held the annual Dean's Circle Dinner at the Wellshire Inn last December to thank generous alumni for supporting the CU School of Medicine and our students.
- Our support for medical student scholarships grew. The Medical Alumni Association Scholarship Endowment provided $6,000 scholarships to two outstanding medical students. We also established Innovation Project Grants to provide funding to students carrying out community service projects to improve healthcare across Colorado.
- As a result of alumni input, a monthly Happy & Healthy Hour series addressing professional self-care was launched in January and has been well received.

This is just part of the significant impact we are making together, and this alumni corner will address in more detail our other activities. We are always looking for new board members, and we enjoy hearing from our fellow alumni. To become involved with the Medical Alumni Association or to learn about other opportunities, please contact the Office of Alumni Relations at 303-724-2518 or healthalumni@cuanscutz.edu.

Sincerely,

Linda Williams MD

Linda Williams, MD '84
President, Medical Alumni Association

Medical Alumni Association Giving Back

The Medical Alumni Association thanks generous alumni benefactors who have made our initiatives to help students so successful. Each year, we have been able to provide every incoming medical student with a stethoscope at the White Coat and Matriculation Ceremony through the Stethoscope Fund, and this holiday season, together we crowdfunded $8,565 toward stethoscopes for the incoming class of 2024. In addition, the Medical Alumni Association is helping to make possible student community service projects through the Medical Alumni & Medical Student Council Innovations Project with competitive grants of $500 to $2,000 per project. We have raised $26,290 toward these projects, directly benefitting people and families across Colorado, and bolstering student education. Every gift will be matched by the School of Medicine, dollar for dollar, up to $50,000. Students are creating connections, impacting the delivery of health care in Colorado, and becoming future leaders in medicine. If you would like to make a gift, please contact vanessa.duran@cuanschutz.edu.

FirstUp Mentorship Program – Housestaff Giving Back their Time

This January, members of the newly formed Office of Diversity and Inclusion Minority Resident Council sat on a panel with our FirstUp medical student group. These first-generation residents and fellows from various departments gave pearls of wisdom on subjects of specialty choice, first generation mentoring and imposter syndrome. Student leaders Troy Kincaid, Freddi Tran and Nguyen Lu helped organize the panel, with sponsorship from the Medical Alumni Association. If you are a first-generation physician interested in mentoring first-generation medical students, please contact vanessa.duran@cuanschutz.edu.

Medical Alumni Association Hosts a Night at the Symphony

Last November, the Medical Alumni Association hosted its annual cultural event, A Night at the Symphony, bringing together more than 115 alumni, students, residents, faculty, staff and guests for a performance of "The Brightness of Light ft. Renee Fleming" by the Colorado Symphony. Attendees enjoyed a reception and speaking program including special remarks from Brett Mitchell, conductor of the Colorado Symphony. Medical students presented community service projects before the performance. Medical students were also given an opportunity to present their community service projects to the alumni association at the reception.

The Medical Alumni Association has hosted an annual cultural event for six years in a row, carrying forward a tradition of bringing together the arts and medicine, and fostering conversation and connections. We appreciate those who attend and support these events, including the engagement and activities subcommittee chaired by Gina Nelson, MD '92, which helped choose last fall's cultural event.

Student Projects YOU Have Helped Support

This academic year, the Medical Alumni Association has been able to provide grants to five student-led community service projects! **Paris Elementary School Future Scientists** gives 3rd and 4th grade students at a Title 1 school an opportunity to participate in hands-on scientific experiments, on a weekly basis, to ignite a passion for the scientific method and STEM fields. **Warren Village Community Garden** is a partnership with Warren Village, which provides housing for low-income, single-parent households, designed to foster healthy eating habits and horticulture therapy with a community garden. **Mitchell High School Healthcare Exploration** partners with Mitchell High School in Colorado Springs, which serves many students from backgrounds underrepresented in medicine by inspiring and empowering adolescents to pursue careers in healthcare through various experiences in the field. **Students for Immigrant Rights** (pictured with Rep. Jason Crow), focuses on educating members of the CU Anschutz community about the migrant experience, advocating for improved standards of care in ICE facilities, and serving those in our community who have immigrated from a different country or who have been affected by ICE or the detention facility in Aurora. Finally, **Cost of Care Conversations** has examined the data on the high cost of healthcare for vulnerable populations in Aurora and is

working with 9News Health Fair attendees to train them on questions they can ask their primary care provider to improve their value of care. The CU School of Medicine has so many passionate and empathetic students, and our alumni are making it possible for them to channel that altruism into areas that truly make a difference.

School of Medicine Reunion

Due to concerns related to the coronavirus COVID-19 pandemic, the School of Medicine Alumni Celebration and Reunion was postponed until fall 2020.

The Medical Alumni Association would like to give a special shout out to last year's 50-year reunion celebrants, the Class of 1969, who through their generous endowment have been granted a Dean's Distinguished Scholarship. The Medical Alumni Association would also like to thank the Class of 1982, who also raised enough money in their endowment to have a named Dean's Distinguished Scholarship. If you are celebrating a milestone year since graduation, and are interested in serving as a class champion, please contact vanessa.duran@cuanschutz.edu.

Check out our Alumni Instagram Account!

We want to celebrate the lives and accomplishments of our incredible alumni. The Office of Alumni Relations has officially launched an alumni Instagram page. Follow us **@cuanschutzalumni** and spread the word. This page will serve as a visual "class notes" so you can keep up with former classmates and colleagues. We are asking for photos from you. Did you get married or have a baby recently? Start a new job, embark on new research, retire, or publish an article or book? Recently win an award, or do humanitarian work in your community or abroad? Do you want to share a photo of a memory from your time in school? We want to hear from you! If you have a photo and story you would like featured, please submit them to zachary.noriega@cuanschutz.edu.

Thomas Flaig, MD, Named Vice Chancellor for Research

Thomas Flaig, MD, professor of medicine in the Division of Medical Oncology, has been named vice chancellor of research for the University of Colorado Denver | Anschutz Medical Campus, effective March 1.

Flaig has been serving as interim vice chancellor since August 2019 and prior to that he had been associate dean for clinical research for the School of Medicine and chief clinical research officer for UCHealth.

In those roles, Flaig led the efforts to improve the clinical trials process and coordinate the research activities between the University and our clinical partners on the Anschutz Medical Campus. His efforts have helped lead to an improved web-based searchable database that researchers, clinicians, and patients can use to find clinical trials conducted by CU faculty.

Flaig also has led local and national multi-center clinical trials. He is a member of the National Cancer Institute's Investigational Drug Steering Committee and the bladder cancer task force. He also serves as chair of the bladder cancer committee for the National Comprehensive Care Network, which publishes internationally recognized treatment guidelines, updated regularly with new research findings. He has active translational research collaborations with colleagues in the School of Medicine, School of Pharmacy and the CU Boulder campus.

Christina Yannetsos, MD, Named a Physician for Team USA

Christina Yannetsos, MD, assistant professor of emergency medicine for the University of Colorado School of Medicine, had been named a physician for Team USA for the United States Olympic and Paralympic Committee for the now-delayed Olympiad in Tokyo.

For Yannetsos, the appointment combines her longtime participation in judo with her medical training. The 2020 Summer Olympics had been scheduled from July 24 to August 9, but have been delayed due to the COVID-19 pandemic.

Before becoming a physician, Yannetsos was a member of the USA Judo National team from 1998 through 2005, qualifying for the 2004 Olympics, but an injury – a separated shoulder – prevented her from competing. She earned medals at multiple world, Pan American, and national competitions.

"Judo is the No. 2 practiced sport in the world, next to soccer," said Yannetsos, who grew up in Miami. "I wasn't very good at first, but I'm one of those kids who if you challenge me, I'm going to keep coming back."

CU School of Medicine Ranked by U.S. News & World Report

The University of Colorado School of Medicine is listed No. 9 on the primary care rankings of medical schools and No. 31 on the research rankings released in March by U.S. News and World Report.

Each year, U.S. News compiles listings of medical schools in these two general categories based on surveys and data reviews of accredited medical schools in the United States. The magazine then assigns rankings to schools using its own criteria to assess the information, which includes peer assessments provided by professionals at other medical schools.

This year, the magazine considered 154 medical schools and 35 schools of osteopathic medicine. Of those 189 institutions, 122 responded and provided the data that U.S. News needed to calculate its rankings. Several factors are considered in the rankings, including quality assessments by leaders at peer institutions, surveys of residency directors, total NIH research activity, median MCAT scores, and percentage of students who enter primary care residencies.

On last year's U.S. News listing, the CU School of Medicine was No. 12 for primary care and No. 30 for research.

"We are focused on building high-quality programs to teach, research, and provide patient care for our diverse community," said CU School of Medicine Dean John J. Reilly, Jr., MD. "Our faculty and staff deserve the credit for their hard work and dedication to excellence, which in turn inspires a new generation of health care leaders."

The magazine also provides rankings of specific specialties based on ratings provided by medical school deans and senior faculty from surveyed schools. University of Colorado School of Medicine programs that were ranked among the best in the country were:

- Family Medicine No. 7
- Internal Medicine No. 27
- Pediatrics No. 8

In addition to medical schools, U.S. News also provides separate rankings other health care training programs. The School of Medicine's Physical Therapy program is ranked No. 13.

Suicide Prevention Tool for Patients in Crisis

Clinicians and researchers at the University of Colorado School of Medicine partnered with Grit Digital Health to create Lock to Live, a web resource to help suicidal adults and their family, friends, or health providers make decisions about reducing access to firearms, medications, and other potential suicide methods.

The self-administered online tool guides a person through detailed questions on storage factors and personal preferences. It then displays storage or disposal options for firearms and medications, including logistical considerations like cost and legal issues.

A pilot trial for Lock to Live was completed at three large emergency departments in Colorado to test the feasibility and acceptability of the tool for adults with suicidal thoughts or behavior.

"Efforts in healthcare settings, like providing this tool to change how dangerous items are stored, can make a big difference for people in crisis," said Emmy Betz, MD, MPH, associate professor of emergency medicine at the University of Colorado School of Medicine and director of the project. "This isn't about gun control. It's about helping people take action to keep themselves and their loved ones safe during tough times."

The results of the pilot trial were published in January, showing that the Lock to Live tool was feasible in a clinical setting, with no issues accessing the content on a tablet in the emergency department and that using it did not interrupt the patient experience.

Information is available at lock2live.org.

CU Anschutz Awarded $4 Million NIH Grant for Innovative Projects

The University of Colorado Anschutz Medical Campus has been awarded $4 million over the next four years from the National Institutes of Health Research Evaluation and Commercialization Hubs (REACH) grant.

The grant will support efforts to turn biomedical discoveries into commercial products and improved care for patients. CU Anschutz was one of only five institutions to receive a grant under the REACH program in last fall's round of funding. The grant connects CU Anschutz to a network of 34 academic institutions developing best practices to translate innovations into public benefit.

With the REACH hub designation, the program will also provide access to key federal agencies, including the U.S. Food and Drug Administration, the Centers for Medicare and Medicaid Services, the U.S. Patent and Trademark Office, in addition to relevant companies and organizations within the industry, and the angel and venture capital investment communities.

The goal of the Colorado Research Evaluation and Commercialization Hub is to develop and expand programming that incorporates industry expertise, mentorship, skills development, and access to funding and relevant resources to guide inventors through proof-of-concept studies to early stages of product development.

Richard Duke, PhD, principal investigator on the Colorado REACH hub grant and associate professor of medicine, said, "Having been a biomedical researcher and academic entrepreneur at CU Anschutz for nearly 40 years, I am excited to witness the translation of the numerous and varied inventions of my faculty colleagues into products that impact patients' lives, which the REACH grant funding will support."

MISSION STATEMENT

CU Medicine Today will keep alumni and others knowledgeable about and connected with the School of Medicine and the University of Colorado by writing truthful and relevant articles and providing a forum for news and comments from alumni.

The Gift of Gratitude

By Oliver Bawmann and Kelsey Repine

As we approach our last few months of medical school, we have many reasons to be grateful.

Over the past four years, we worked alongside inspiring health care providers, held patients' hands on the way to the operating room, provided comfort and reassurance, celebrated when patients were healthy enough to discharge, and reflected on the loss of patients who never had that chance.

We gained a glimpse into the world of medicine that most other people never do. Now, as we prepare to receive our degrees, we are struck by what a profound privilege and immense responsibility our degrees confer.

It hasn't always been easy to feel grateful.

We are training at a time when physician burnout is rampant. This dilemma applies to medical students too and our own journeys have had their struggles, frustrations, and moments of despair or melancholy.

To prevent burnout among our fellow students, we worked with University of Colorado faculty, administrators, and physicians to create a unique CU School of Medicine-themed gratitude journal for medical students. Faculty contributed over 50 reflections on the importance of gratitude during their training and careers.

In August, we presented these journals to matriculating medical students at the White Coat Ceremony. Along with their first stethoscope and white coat, they also received this gratitude journal to remind them the importance of their own wellness as they embark on their medical school journeys.

In the introduction, we write: "Our challenge to you is to take one minute and write down three things you are grateful for every day. No sentiment is too small. Be grateful for hot coffee, meaningful conversations with faculty, doughnuts at the hospital cafeteria, or peers helping your study for the next exam. Be grateful for the resident who spent time teaching you, the patient who made you laugh, or the patient who thanked you for being their 'doctor'."

We went on to write: "Indeed, the next four years are going to be grueling, at least at times. However, we also hope that they will be some of the best years of your lives. You will meet people and make friends who will change your life forever. You will be challenged and will grow in ways you didn't think possible.…Our hope is that throughout the ups and downs of the years to come, you will practice gratitude each day, and that you'll benefit from this positive reflection."

As our medical school journey ends and we reflect on our time here, we express our gratitude for

- opportunities to learn from the wonderful CU faculty who shared their expertise and provided endless support;
- careers that will focus on promoting the well-being and health of others through thoughtful and evidence-based, compassionate, and empathetic care; and
- our patients past, present, and future, who allow us to sit with them and support them through disease, treatment, and cure.

Oliver Bawmann

Kelsey Repine

It has been a joy and a privilege to develop these gratitude journals for our CU community. We hope that they create a legacy of finding gratitude each day for years to come.

Oliver Bawmann and Kelsey Repine are members of the CU School of Medicine Class of 2020.

What Every Doctor Should Know About the Holocaust

By Matthew Wynia, MD, MPH, and Meleah Himber, MEd

In 1930, Lili Elbe—the Danish artist portrayed in 2015 film *The Danish Girl* —went to the world's first Institute for Sexual Science in Berlin to see Dr. Magnus Hirschfeld, a German Jewish physician who supervised her initial sexual reassignment surgery.

Soon after, a promising young U.S. heart surgeon, Dr. Michael DeBakey, arrived in Germany to complete his surgical training.

German physicians and scientists of the pre-WWII era were largely responsible for the invention of the electron microscope (identifying asbestos in lung cancers), advances in cancer epidemiology (advocating for breast cancer screenings and sounding the alarm on the public health impacts of smoking), and even the first vending machines selling new seamless rubber condoms invented by Polish-German and Jewish chemist Julius Fromm.

German medicine and scientists of the 1930s led the world; and they were also the only country in the world to have a written code of research ethics, and the first to include required coursework on ethics for all medical students.

Yet, Germany's leadership in medicine and science was at the heart of heinous crimes. By the time Auschwitz was liberated in 1945, countless people had been victims of unconscionable medical research, and over six million Jews and many disabled, homosexuals, Roma/Sinti had been killed.

What happened?

Prestigious academics played an important role, teaching a "science" of "racial biology," suggesting that a superior "Aryan race" could be achieved through eugenics. They encouraged those who were "valuable" to society to reproduce and stay healthy, and they called for preventing "undesirable" people from being born, or eventually killing those already alive.

The Nazis were also effective at *Gleichshaltung*, the synchronization of national intellectualism and values, including a vision that the health of the Volk superseded the rights of individuals. Professors were told that "From now on, it will not be your job to determine whether something is true, but whether it is in the spirit of Nationalist Socialist revolution."[1] Jewish professors and others who did not agree were removed from their positions. Medical faculties "de-emphasized basic research, shortened the time of medical study to produce more doctors for the state…and [gave] greater stress to military medicine, populations, politics, and racial biology."[2]

Independent medical societies were disbanded and replaced with a single state-sponsored Federal Chamber of Physicians. Just three years after Lili Elbe's surgery, the Nationalist Socialist Student League destroyed Dr. Hirschfeld's Institute, burning his research and records. Dr. Hirshfeld was forced into exile.

When Nazi physician Karl Brandt authorized the killing of an infant born with deformities in 1938 at the University of Leipzig Hospital, it was the first "mercy killing" in the child "euthanasia" program. This set the precedent for 5,000 children and 200,000 adults eventually killed in the T-4 "euthanasia" program. These medicalized murders were portrayed as acts of healing—killing individuals to "heal" the nation while reclaiming state resources "wasted" on the institutionalized. The subsequent mass murder of Jews borrowed many techniques and personnel from the T-4 program, including the use of gas chambers. Nazi propaganda portrayed Jews as "infectious germs," which had to be eliminated to improve the health of the nation.

Doctors today – not just Jewish doctors, but all doctors, all around the world – should know that German physicians and scientists of the 1930s were world leaders, and that together they fell from this perch. This knowledge means that the question for the medical profession today is not how did a few monsters crawl up from the depths into our midst? Instead, we must struggle to understand how most doctors, in the most advance industrialized nation in the world, became murderers together, and not *despite* their training but *in the name of science and public health.*

Matthew Wynia, MD, MPH, is the director of the CU Center for Bioethics and Humanities, which produces the annual Holocaust, Genocide and Contemporary Bioethics (HGCB)Program to promote education, scholarship, and community engagement on the lessons of the Holocaust for health care and society.

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[1] Bracher, *Dictatorship* [38], pp. 247-248.

[2] Robert Jay Lifton. *The Nazi Doctors and the Psychology of Genocide.* (New York: Basic Books, 2017) pp. 38-39.

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Nancy Nelson, MD '59, photographed with her brother Jim Nelson, MD '63.