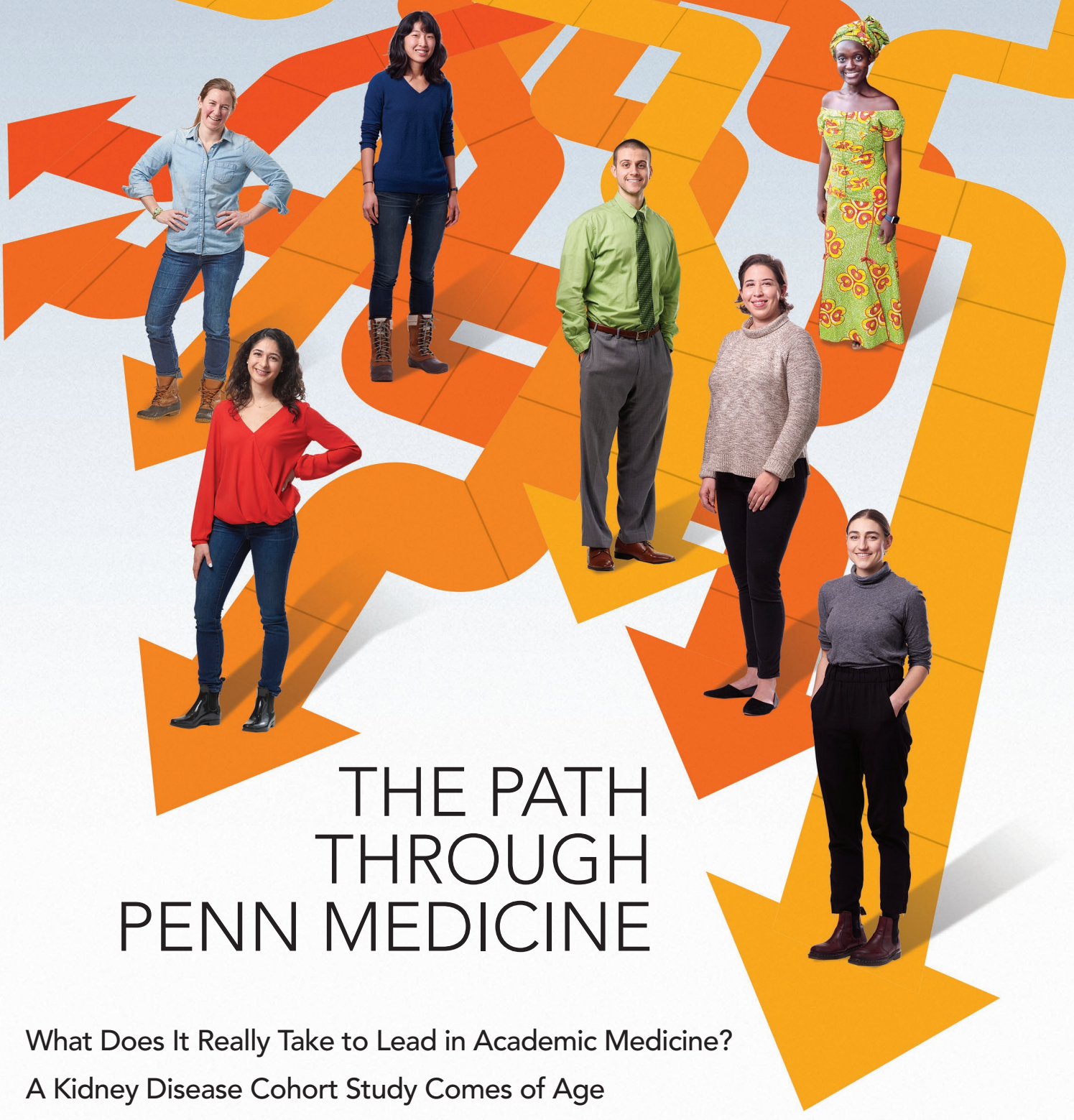
SPRING/SUMMER | 2019

PENN Medicine



THE PATH THROUGH PENN MEDICINE

What Does It Really Take to Lead in Academic Medicine?

A Kidney Disease Cohort Study Comes of Age

Blue

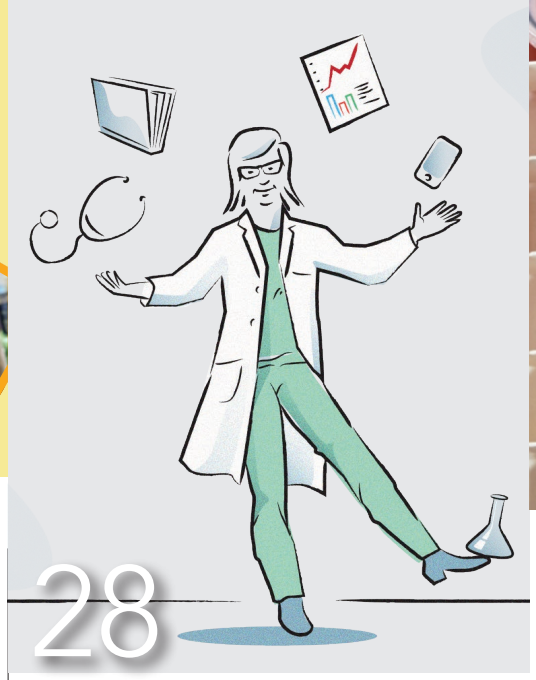
By John Infanti

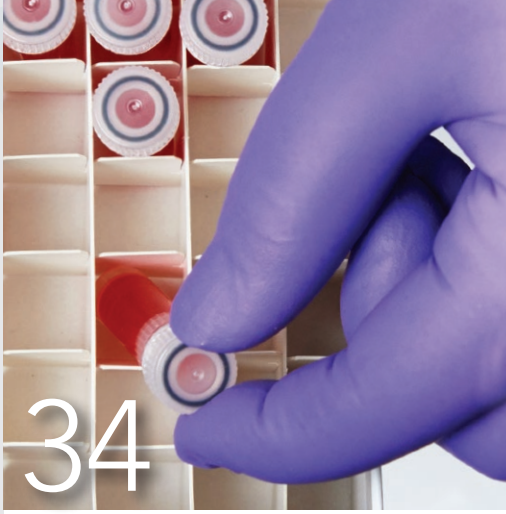
Photo by Andreea Dimofte

It's a vista that transports cancer patients and their loved ones away from their treatment center and across the world. As part of the Radiation Oncology Quality of Life program, a treasure trove of paintings and photographs rotates through the department's waiting room in the Perelman Center for Advanced Medicine. Every piece is created by members of the Radiation Oncology team, including an exhibit called "Blue" by physicist Andreea Dimofte, PhD, which features photos taken across Santorini and showcases the combination of the many shades of blue and white tourists see when visiting the Greek island.

"Sitting in a coffee shop overlooking this blue cupola and the sea behind it, you can't help but feel that you are surrounded by beauty," Dimofte said. "I hope this particular exhibit will transport patients to this beautiful island and shift their mindset to more optimistic, positive thoughts." She also noted that many patients have expressed a desire to visit the island after seeing the photos. Patients can view them as they walk down the hallway toward proton treatment rooms. "It's a place that makes you feel serene, comfortable, and welcome, and my hope is that these feelings will transfer to our patients," Dimofte said.

In addition to showcasing art, the Radiation Oncology Quality of Life program also offers patients and their caregivers an immersive, voice-guided virtual-reality meditation program in the waiting room. Read more at PennMedicine.org/magazine/RadOncVR.





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Notes on Coming of Age

You wouldn't have been able to tell by looking at me, but I was probably the most overeager person at the inaugural concert of the Penn Med Symphony Orchestra in December 2016. The performance was held on the eve of my first day as editor of *Penn Medicine* magazine. But before my official new employee orientation day I'd created a custom curriculum for myself. It started with reading six years of back issues of the magazine and a small stack of books about the editor's craft, and it culminated in that afternoon at Irvine Auditorium, swathed in sound.

I only learned later that two of the items on my unofficial orientation agenda had a connection: Gina Chang. Gina was not just one among a group of medical students who my predecessor, John Shea, profiled in this magazine's pages in the fall of 2015 as they were beginning medical school. She was also someone who had gone on to become a co-founder of the orchestra and its principal cellist. I would soon get to know Gina and several of her classmates from John's 2015 story, as my colleagues and I began work on what became this issue's cover story.

"The Path Through Penn Medicine" was a years-long process, not just for the medical students who lived that four-year journey through medical school, but also for those of us who got to know them for the piece that begins on page 12. We started following up with students again to work toward this sequel story when they were in their second year, not long after that first orchestra concert. At that time, we solicited their recollections of their first year while they were relatively fresh. Thereafter, we checked in every few months to capture their life events and their aspirations, frustrations, and interests as they unfolded. We wanted to hear what they had to say in the moment, and ultimately to convey the experience in their voices. Sometimes hindsight is 20/20, but sometimes it smooths out too much of your view of the twists and bends, the rise and fall, of the path behind you. We wanted to glimpse as much of the real journey as we could, and you'll see those in-the-moment reflections represented in the present-tense storytelling throughout the piece. (Attentive readers will also note that they caught some glimpses along the way already, as we shared periodic updates on some of the students annually on the Penn Medicine News Blog and, in brief, here in the magazine.)

Becoming the professional you dreamed you'd become is one of the most essential aspects of coming of age—a theme that makes more than one appearance in this issue. The 18-years-running Chronic Renal Insufficiency Cohort study makes its own kind of coming-of-age tale for epidemiological research, worth diving into on page 34. The phenomenon of continued maturation and evolution is also evident

in the feature story about the emergence of new leadership training needs in academic medicine (p.28), and in this issue's parting thoughts from Suzanne Rose, MD, MSEd, (p.56), looking ahead to the future of medical education just over a year into her tenure as senior vice dean for medical education.

Just before this issue went to press, Irvine Auditorium once again swelled with sound at the Penn Med Symphony Orchestra's Spring 2019 concert. The group has not only performed twice each year since its launch two and a half years ago, but it has grown to include medical professionals and students from a number of other medical centers in the city and region. The orchestra's maturation and growth is a fitting analog to the experiences of the students you'll learn more about in this issue. I hope you enjoy sharing in their

RE

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Perelman School of Medicine Ranks Among the Best

More than 250 years after its founding, the nation's first medical school continues to prove itself an innovative and interdisciplinary leader in academic medicine. This year, the Perelman School of Medicine (PSOM) was not only ranked #3 among the best research-oriented medical schools in the country—nabbing a top-ten spot for 22 consecutive years according to *U.S. News & World Report*'s annual "Best Graduate Schools" report—but also ranked among the top training grounds in nine specialty areas.

"This recognition is a testament to our faculty, staff, and students who come together each and every day to create an incredible learning environment, driving forward our mission to advance research and clinical practice, and to improve health across the world," said J. Larry Jameson, MD, PhD, dean of PSOM and executive vice president of the University of Pennsylvania for the health system. "Penn has a long tradition of academic excellence and scientific discovery, and our students build on this foundation each year as they grow and define the future of health care. Our faculty and staff have dedicated themselves to fostering innovation and paving the way for future breakthroughs in the classroom, the clinic, and the lab."

U.S. News & World Report Rankings

1 Pediatrics

3 Anesthesiology

4 Obstetrics/Gynecology, Radiology, and Surgery

5 Internal Medicine

9 Psychiatry

10 Primary Care

19 Family Medicine

These rankings are based on statistical quality indicators such as peer and program director assessments, research activity and federal funding, faculty resources, and student selectivity, as evidenced by MCAT scores, grade point averages, and acceptance rate.

Remembering a Peerless Partner

Penn Medicine mourns the loss of Raymond G. Perelman, a committed philanthropic partner and, in the words of UPHS CEO Ralph W. Muller, a "wonderful champion" of the health system. His impact on Penn was transformative, paving the way for future physicians attending the Perelman School of Medicine and ensuring the delivery of cutting-edge medical care at the Perelman Center for Advanced Medicine. Perelman's vision—and that of his late wife, Ruth—helped Penn become a global force in patient care, research, and education.

Read more about the legacy of this world-class Penn ally on page 46.

Kevin Mahoney
Named CEO of UPHS

On a bright afternoon this March, Penn Medicine faculty and staff gathered in the atrium of the Perelman Center for Advanced Medicine in what has become a characteristic "flash-mob" style celebration. Snacking on soft pretzels, they raised glasses to toast the good news that one of Penn Medicine's longest-serving leaders will soon rise to a new level.

Kevin B. Mahoney will become the next CEO of the University of Pennsylvania Health System (UPHS) on July 1, succeeding Ralph W. Muller, who is stepping down after 17 years of distinguished and visionary leadership. Mahoney is a 23-year veteran of Penn Medicine, currently serving as the executive vice president and chief administrative officer for UPHS, as well as the executive vice dean for Integrative Services for the Perelman School of Medicine.

Among his marquee leadership achievements at Penn Medicine, Mahoney developed the master plan concept for the former Philadelphia Civic Center site, known today as the Ruth and Raymond Perelman Center for Advanced Medicine and the Roberts Proton Therapy Center. These facilities, together with the Smilow Center for Translational Research and the Jordan Medical Education Center, became the nation's first single building to fully integrate biomedical research, clinical care, and medical education. Building on this success, Mahoney planned and now leads the project for the Pavilion, the new inpatient facility adjacent to the Hospital of the University of Pennsylvania, set to open in 2021. It is the largest building project in Penn's history.

J. Larry Jameson, MD, PhD, executive vice president of the University for the Health System and dean of the Perelman School of Medicine, noted that Mahoney has served as the "chief architect" behind many of the efforts for which Penn Medicine has become nationally renowned.

"He was an early and strong contributor to our campus-wide efforts to make innovation part of Penn's and Penn Medicine's DNA. Those efforts are saving lives across the world, spurring Penn Medicine's role in the development and commercialization of six FDA-approved therapies within just the past 18 months," Jameson said. "Kevin is a champion for the ideas that will become tomorrow's cures, supporting everything from small-scale start-up efforts to larger commercialization agreements and industry partnerships that are mapping what the future of health care will look like."

Piecing Together the Pavilion

If you have visited Penn's campus recently, you can't miss it: The Pavilion—Penn Medicine's new, $1.5 billion hospital and the largest capital building project in Penn's history—has risen to its full 17-story height in steel beams, with partial external sheathing on some floors. Soon enough, the building at the former site of Penn Tower will be outfitted with adaptable, private patient rooms, hybrid operating rooms, and state-of-the-art technology. But there are many smaller details that will impact the patient experience, too. Here's a behind-the-scenes look at some of the projects underway.

Walk This Way: For a temporary escape from the hustle and bustle of the hospital, patients, visitors, and staff will be able to enjoy a walkway surrounded by more than 60 species of trees and ferns. The 670-foot long path between the Pavilion and the Penn Museum will offer a space to de-stress in the sunlight and greenery, as well as an easily accessible route to between a new pedestrian bridge and SEPTA's University City station.

Heading Underground: The Pavilion has risen high over the Penn campus, but progress is underway below ground, too. A 130-foot long tunnel is being constructed between its emergency department and the Hospital of the University of Pennsylvania's Silverstein basement. The tunnel—constructed from nearly 735 tons of concrete—will provide privacy as patients are transported between buildings, plus an efficient way to deliver supplies and medications.

The Key to the Restroom? Efficiency: Instead of constructing 500 patient restrooms onsite, an offsite manufacturing team has been assembling them at the "PennFab" warehouse nearby then delivering them in groups to reduce the impact on traffic. This process ensures higher quality, reduced waste, and increased safety. With acrylic walls and resin epoxy floors, the restroom pods were designed for optimal maintenance. About 56 pods are delivered monthly, each weighing over one ton.

National Partnership Aims to Understand and Harness the Human Immune System

Could the immune system someday be the basis for how new therapies are developed? "If we can understand the immune system, we can turn it in the patients' favor to treat many, many diseases," said E. John Wherry, PhD, chair of Systems Pharmacology and Translational Therapeutics and director of the Institute for Immunology at Penn. "If we do this right, we will change the way we practice medicine and medical ideas about what immunology is, and we will turn immunology into a clinical discipline."

Wherry leads one of the five teams from leading clinical research organizations collaboratively partnering with the Allen Institute—a Seattle-based, non-profit bioresearch organization—in its newly launched Allen Institute for Immunology. Researchers dedicated to studying the immune system, including the Penn team, will examine how this complex system works in healthy individuals and in those with immune-related diseases.

Because researchers do not have a complete understanding of how a healthy immune system behaves, it's difficult to identify what's going wrong when a patient develops an immune-related disease. In partnership with the Children's Hospital of Philadelphia, Penn will address this knowledge gap by examining the normal baseline of immune health in children and immune distresses in individuals treated with immune-modifying drugs to treat inflammatory bowel disease or malignant melanoma. The team aims to understand why some individuals respond to certain immune-based treatments while others don't, and to develop more targeted therapies and preventative measures.

AHA Recognizes Lancaster General Health as a Community Champion

Penn Medicine Lancaster General Health has won the 2018 Foster G. McGaw Prize for Excellence in Community Service, a prestigious national award presented by the American Hospital Association and the Baxter Allegiance Foundation to a hospital that demonstrates an unwavering commitment to identifying and addressing community health and wellness needs.

Jan Bergen, president and CEO of LG Health, noted that the health system has made a tremendous impact in the community in five main areas: providing quality health care for all, improving mental health, making healthy choices easy choices, enhancing preventative care, and responding to substance abuse.

Pennsylvania Hospital's Evolving Landscape

Penn Medicine has opened a new Spine Center at Pennsylvania Hospital (PAH). The center builds on Penn's multidisciplinary network of spine and pain care experts and provides both outpatient and inpatient care. With evaluation, diagnosis, and both surgical and nonsurgical treatments under one roof, patients experiencing spine and back issues can receive efficient and convenient care at the historic hospital in Philadelphia's Society Hill section, founded in 1751.

The new Penn Medicine Cardiac Rehab at PAH also seeks to build a healthier community by addressing a gap in the health system's Heart & Vascular service line and providing patients with a downtown space dedicated to physical and mental rehabilitation and recovery following cardiac events.

Theresa Larivee, CEO of PAH, notes that these programs provide innovative, integrated care and represent "a vision for the future of care for patients that no other health system in the region can match" while underscoring PAH's commitment to putting "patients first at the nation's first."

Ralph W. Muller, CEO of UPHS, Theresa Larivee, CEO of PAH, William C. Welch, MD, medical director of the Spine Center and chair of Neurosurgery at PAH, and M. Sean Grady, MD, chair of Neurosurgery at the Perelman School of Medicine

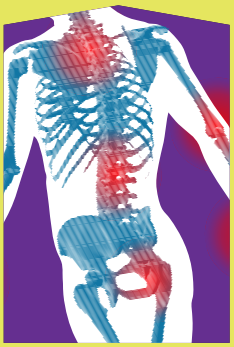
Research Countdown

32,624 FRACTURES resulting from pet-related accidents among patients 65 and older were identified across ERs nationwide. A Penn study published in *JAMA Surgery* found that while dog-walking provides older individuals with regular exercise, fractures related to these walks—mainly in the hips and upper extremities—more than doubled between 2004 and 2017. The researchers hope their findings will prompt deeper considerations about the risks everyone faces as they age, especially as physical activity continues to be emphasized for seniors.

49 PERCENT of patients with Google accounts were willing to share their search histories with Penn researchers, which revealed a tendency to consult "Dr. Google" first. The study, published in *BMJ Open*, found that health-related searches doubled among patients in the week before an ER visit, with more than half looking up symptoms and potential health conditions. For the researchers, these findings highlight an opportunity for clinicians to adjust how they approach topics and provide useful information to patients.

9 HEARTS have saved the lives of transplant patients during a Penn Medicine trial. The twist: The transplanted hearts were from deceased donors who were infected with hepatitis C virus (HCV). For decades, most hearts infected with HCV were discarded, but according to research published in the *American Journal of Transplantation*, new antiviral treatments work well in immunosuppressed patients, broadening the donor pool and creating a new, viable option for individuals on a transplant waitlist. Researchers are now studying the same approach in patients awaiting a lung transplant.

275 PATIENTS undergoing spinal and peripheral nerve surgery were part of a Penn study utilizing a novel Enhanced Recovery After Surgery (ERAS) protocol. The research, which was published in the *Journal of Neurosurgery: Spine*, found that one month after surgery, only 38 percent of the ERAS group—which underwent outcome-optimizing interventions ranging from smoking cessation and multimodal pain management to drinking liquid carbs before surgery—continued using opioids compared to 53 percent of the control group. The groups' pain scores were also similar, indicating that the ERAS pathway offers an effective replacement for traditional opioid-heavy treatment.



16 HOURS is the daily shift limit imposed on first-year residents, but research published in *NEJM* suggests this well-intentioned cap and the limit of 80 hours per week are not necessary for patient safety. The study—part of the larger Individualized Comparative Effectiveness of Models Optimizing Patient Safety and Resident Education (iCOMPARE) study—shows that when medical residents were permitted to work shifts longer than 16 hours, patient mortality was not affected, and the doctors did not experience chronic sleep loss.

1 WORD is most associated with negative hospital reviews on Yelp: "told." Published in the *Journal of General Internal Medicine*, a Penn study found that among one-star reviews, "told" appeared nearly 20 percent of the time, indicating frustrations about information that wasn't shared effectively, a lack of listening, and feelings of futility. Assessing these reviews may be a helpful tool in identifying areas for improvement in the patient experience and communication in health care settings.

Honors & Awards

Ralph Muller Receives AHA's Highest Honor

The American Hospital Association (AHA) presented its Distinguished Service Award to Ralph W. Muller, CEO of UPHS, at its annual meeting in April, honoring his visionary leadership and transformative impact on Penn Medicine. This award—the AHA's highest honor—recognizes significant lifetime contributions to health care institutions and associations.

For AHA President and CEO Rick Pollack, Muller's commitment to public service and to advancing patient care in Philadelphia and beyond has made him "a mentor to many in the field—including me," and helped shape "an entire generation of health care leaders who are working to build a better future for hospitals, health systems, and the patients we serve."

ASCO Awards Top Prizes to Penn

Two members of the Abramson Cancer Center were honored by the American Society of Clinical Oncology (ASCO) and ASCO's Conquer Cancer Foundation at the organization's annual meeting.

Hologic, Inc. Endowed Women Who Conquer Cancer Mentorship Award: Lynn M. Schuchter, MD

Chief of Hematology/Oncology, Program Leader for the Melanoma and Cutaneous Malignancies Program, C. Willard Robinson Professor of Hematology/Oncology

This award pays tribute to exceptional female leaders and mentors who are committed to supporting the professional development of female colleagues as clinicians, educators, and researchers.

Humanitarian Award: Lawrence N. Shulman, MD, FACP

Director for the Center of Global Cancer Medicine, Deputy Director for Clinical Services in the Abramson Cancer Center, Professor of Medicine

This award recognizes an oncologist who goes above and beyond the call of duty in providing outstanding, innovative patient care and exceptional service and leadership both in the United States and abroad.

Clinical Research Achievement Awards

Three Penn Medicine researchers received Clinical Research Achievement Awards from Clinical Research Forum. These awards celebrate the nation's ten most outstanding clinical research accomplishments during the previous year.

Joseph A. Fraietta, PhD

Assistant Professor of Microbiology

Fraietta was recognized for leading a study predicting the response of patients with chronic lymphocytic leukemia (CLL) to chimeric antigen receptor (CAR) T cell therapy.

Lindsey A. George, MD

Assistant Professor of Pediatrics, Attending Physician in Hematology at Children's Hospital of Philadelphia

George was honored for her work as the lead investigator for the first gene therapy trial to report a clinical cure for hemophilia B patients.

Courtney A. Schreiber, MD

Associate Professor of Obstetrics and Gynecology

Schreiber was lauded for heading the only randomized clinical trial to test the efficacy of mifepristone and misoprostol for managing miscarriage.

2019 Rolf Luft Award from the Karolinksa Institute

Mitchell Lazar, MD, PhD

Chief of Endocrinology, Diabetes and Metabolism, Willard and Rhoda Ware Professor in Diabetes and Metabolic Diseases, Founding Director of the Penn Institute for Diabetes, Obesity, and Metabolism

This award, presented by the Karolinska Institute in Stockholm, Sweden, celebrates outstanding scientific contributions in endocrinology and diabetes. Lazar received the award in recognition of his work in transcriptional regulation of metabolism.

The honors and awards listed on this page are just a few of the highlights among Penn Medicine's highly lauded leaders, faculty, staff, and trainees. **For more honors, see p. 48.**

A Home for HUP's House Staff

When house staff at the Hospital of the University of Pennsylvania need to recharge after a long shift, the new House Staff Wellness Center on 1 Dulles offers fellows and residents a quiet area to rest, a comfortable space to relax with colleagues, and the perfect place to reenergize before going back to their patients, all in one.

"There's a loss of physician lounges across the U.S., and this space is bringing it back. Physicians from different specialties can interact and collaborate, and it's a great addition to our culture," said Alex Bonnel, MD, an Emergency Medicine fellow and president of the House Staff Governing Council.

The newly renovated center, made possible by generous donors, includes a computer lab for charting, a fitness room with a treadmill, elliptical, and free weights, two soundproof nap pods with chairs that convert into beds, a communal TV lounge, and a private lactation room.

Take a video tour of the Wellness Center yourself online at http://bit.ly/2JJxe6Q/

You Can't Be What You Don't See: #WomenofPenn Role Models Share Their Success Stories

When Kristy Weber, MD, was in medical school, she heard over and over again that women couldn't get into orthopaedic programs. They were too demanding, too competitive, and required more strength than she could offer. That sealed her decision. Today, she is the chief of Orthopaedic Oncology, director of the Sarcoma Program in the Abramson Cancer Center, and the Abramson Family Professor in Sarcoma Care Excellence, and she was recently named the 87th president of the American Academy of Orthopaedic Surgeons (AAOS)—the first woman to ever hold the position.

Institutions nationwide continue to make significant strides to end gender bias in medicine and to empower women in the field, and visible leaders and role models like Weber continue to pave the way. At Penn Medicine—named #2 among the nation's best employers for women by *Forbes*—one doesn't have to look far to find exceptional women researchers, clinicians, and mentors. The #WomenofPenn blog campaign—a joint effort between the Penn Medicine Communications and FOCUS on Women's Health and Leadership teams—regularly pairs an early-career woman with a successful role model to discuss accomplishments, challenges, and lessons learned.

Judith Margolin, PsyD, discusses her professional journey and work at Penn Medicine Princeton House with pre-doctoral intern Jamie Berg for a #WomenofPenn post.

Reproduced by permission of the American Academy of Orthopaedic Surgeons

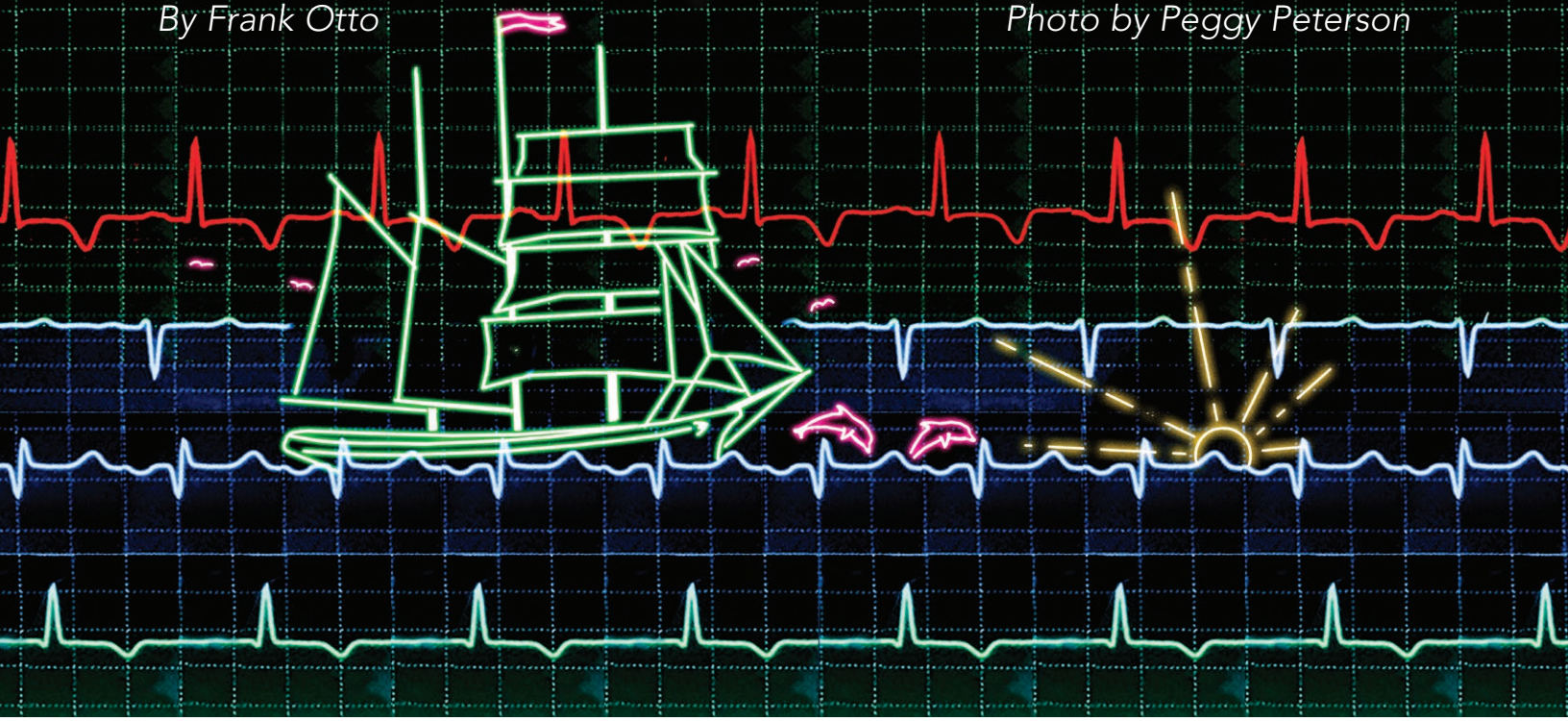
Kristy L. Weber, MD, assumes the AAOS presidency alongside nieces Marlo and Cora.

From Debbie Driscoll, MD, chair of Obstetrics and Gynecology, whose early days as a candy striper and unit secretary launched her on a path toward becoming one of the world's leading obstetrician-gynecologist geneticists, to Judith Margolin, PsyD, clinical director of the Penn Medicine Princeton House Behavioral Health Women's Program, whose work/life balance practices prevent her from taking patients' trauma home with her, the stories illuminate some of Penn's most fascinating personalities.

To follow along with their stories, visit the Penn Medicine News Blog at PennMedicine.org/news/news-blog and follow the hashtag #WomenofPenn on social media.

Telemedicine's Tall-Ship Captain

By Frank Otto *Photo by Peggy Peterson*



Almost three decades ago, Ann Huffenberger was at the start of her career as a full-time registered nurse.

Then she quit.

After following the familiar pipeline of high school to college to career, Huffenberger felt the desire to travel. She wanted to see different places, different people and different cultures. That's when the sea called.

"I had gotten the invitation to volunteer as a medical officer aboard a tall ship that was sailing out of Philadelphia," said Huffenberger, now the director of the Penn Center for Connected Care. "So I resigned my position as an RN. After my first summer aboard, I didn't really look back."

Her ship was the *Gazela*, a 177-foot, fully rigged Class A tall ship—the largest class. Built in Portugal in 1901, *Gazela* had been a fishing vessel that ran along the Grand Banks off of Canada catching cod, halibut, flounder and other fish typical to that area of the Atlantic. From the early 1900s until the late 1960s, the *Gazela* annually returned to Portugal overflowing with *bacalao*, salted, dried cod, which was a staple food of the times.

Huffenberger, then known by her maiden name, Ann Cleaver, came aboard in 1989, after the ship had been converted into a sail training vessel. She spent the next 10 years splitting time, going to sea for months at a time before returning to the hospital as a part-time nurse in between voyages.

"Every chance I could, I took trips. But I had to balance it between hospital demands and my bank account," she reflected, laughing.

Huffenberger also poured her love of sailing into earning a captain's license in the U.S. Merchant Marine through the Coast Guard. After that, she became the first female captain in the *Gazela*'s long history. As a captain, Huffenberger gained experience and insight into leading a team that would later benefit her as the leader of Penn Connected Care, where she oversees projects like the Penn E-lert® eICU telemedicine intensive care team and OnDemand, a service that arranges urgent-care digital video visits with primary care providers for Penn Medicine employees. Huffenberger has emphasized the need for these teams to be agile and versatile, ready to face any challenge that might come up out of the blue—attributes she prized in her crews on the water.

"The people on board, they're all you have, that's your universe," Huffenberger said. "You don't have the safety net of calling 911. You need to prepare to manage emergencies, so that's what we did: We built the core competencies of the people on board. Any time you're

leading a team of people, it's key to develop their skills and pull out their greatest potential."

Strong teamwork was vital because Huffenberger was sailing a fully rigged ship, a traditional century-old style that is difficult to maneuver in today's congested waterways. They navigated using the sun, the moon and the stars, with their radar system only being of use when they were close to land. Wind power was the chief method of conveyance, forcing the crew to tend to "hundreds of lines," according to Huffenberger.

On top of all of that, they had to properly manage food and freshwater supplies, monitor the weather, and successfully maneuver through foreign ports and their customs processes.

Under Huffenberger, *Gazela* made trips all along the Eastern Seaboard, including its old ports of call in New England, Nova Scotia, Cape Breton, and Prince Edward Island.

"It was a privilege and an honor to sail these coastal communities who embrace *Gazela* for her long-standing maritime history," Huffenberger said. "To meet and tell stories with the descendants of the fisherman from the Portuguese cod fishing fleet of the Grand Banks that *Gazela* was the last representative of was simply astounding."

In 1999, Huffenberger left the *Gazela* after a decade with the ship. She met her husband and began working at a VA hospital in New York state as a full-time nurse again. Then, with her captain's experience, Huffenberger realized she wanted to continue pursuing leadership roles. And like her time on the ship, she continues to build teams founded on responsibility to each other. Seeing how important it was to have crew members who could fill in multiple jobs and step up for each other, Huffenberger continues that tradition in her teams that do everything from monitor Penn's ICU beds to handle patients calling in with eye injuries or the flu.

Reflecting back, although she may have left a nursing job to begin sailing, Huffenberger credits her nurse sensibilities for her success on the water.

"I used to say it all the time and I still believe it: my decision-making skills as a captain weren't unique. They were nurse skills," she said. "It's all about prioritization, and we do that all the time as nurses."

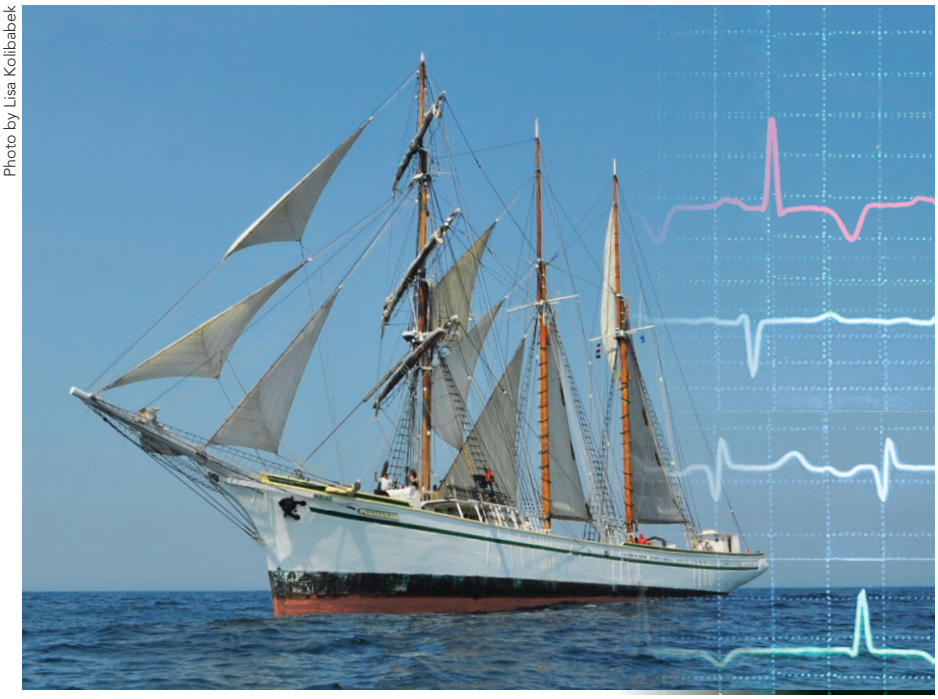
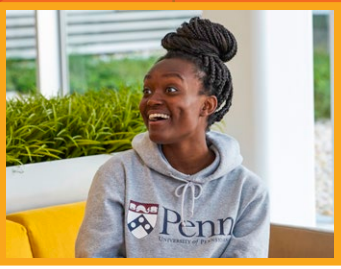


Photo by Lisa Kolibabek

Read this story online with related links at PennMedicine.org/magazine/Gazela.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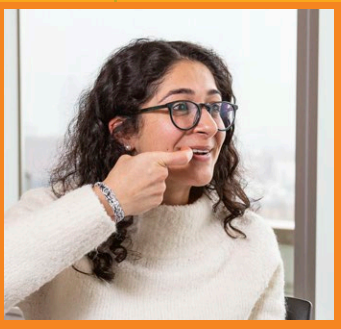



Sabrina



THE PATH THROUGH PENN MEDICINE

Seven students. Four years. Though some travel together, the path through medical school is a different journey for everyone.

By Rachel Ewing and MaryKate Wust

IT IS THE FALL OF 2015, a time of both reflection and new beginnings. The Perelman School of Medicine is celebrating its 250th anniversary, while the bright, new Henry A. Jordan M'62 Medical Education Center (JMEC) opens and welcomes medical students for the first time. The incoming class this year is the first to study in the midst of this newly interconnected hub of medical education, clinical care, and research on Penn Medicine's West Philadelphia campus. Included in this fresh-eyed cohort are a cellist, a health policy analyst, and a wilderness first responder, among other new first-year medical students who are profiled in a Fall 2015 *Penn Medicine* magazine story called "The Path to Penn Medicine." Arriving from distinct origins, these students converge onto a shared new beginning at Penn in a milestone year.

What follows is the story of the next four years of that journey, related by the students themselves as it unfolds.

"YOU WILL NEVER HAVE MORE FREE TIME"

When a fourth-year medical student imparts advice to the MS1 class—*You will never have more free time than you do during the first year, but later on, your academic and clinical obligations will become more fulfilling*—Miami native and Brown University graduate Amanda Labora inwardly scoffs. "I couldn't possibly have less free time," she thinks.

During the preclinical curriculum—classroom learning, first in modules focused on basic science and gross anatomy, then in modules organized around organ systems—the amount of knowledge she must absorb hits Labora and her classmates as a deluge. It threatens to drown students who felt confident as the best and brightest among their undergraduate peers.

"It's a huge learning curve," says Mariah Owusu-Agyei, who majored in economics at Penn, worked as a financial analyst, and later completed pre-med studies at Bryn Mawr. "You don't know the most efficient way to use your time. You also just don't have enough time."

As she begins medical school, Katie McDermott intends to be "the sort of student who attends every lecture and prepares thoroughly for every small group, studies early and eats well, and sleeps enough and reads for pleasure." Immediately after describing this goal, she admits she never consistently maintained those habits before as an undergraduate at Fordham University or post-bac student at Bryn Mawr. Things don't work out that way during her preclinical studies, either. Some subjects come very easily. Others don't. She comes to rely heavily on her learning team, a small group of classmates assigned to work together, for both academic and personal support. This group creates "a safe place to learn, a safe place to come and say, 'I don't know this,' or to say, 'I do know this,' and then to hear that I'm wrong. And to have a really good time," she says. Finding a love for collaborative learning makes intuitive sense to her, as she's discovering that medicine is "inherently team-based at every level."

Despite the hardships, there is a feeling of arriving on the right path. "Once I get into the books, I love it so much," Owusu-Agyei says, bubbly even at the end of a long day. "Even though I'm probably the most miserable I've ever been in life, I've almost never been as happy as I am now. That's the weird thing about it. It's very challenging. It takes a lot out of you. But at the same time, I just love waking up and going to do this. I feel like I definitely made the right decision."

EXTRACURRICULAR PURSUITS

Gina Chang, a Washington University graduate and classically trained cellist, studies a lot in her first year, but finds time to spend with old and new friends, too. "Part of the reason I chose to go to Penn was that the students I met seemed well-balanced, able to study hard but also maintain other interests and relax, and I was happy to find that that was the case."

Sabrina Layne, a Stanford alum from Long Island, finds that, perhaps for the first time in her life, she has a hard time concentrating on studying; basic science just isn't as motivating as learning about real patients, the real people she wants to help. She fills that void by volunteering with a student-run community clinic, the University City Hospitality Coalition (UCHC), as does Michael Stephens, a Thomas More College graduate who also pursues a clinical interest during this time by co-chairing the student Dermatology Interest Group. Working with UCHC to provide care to underserved patients represents these students' first foray into clinical medicine, a first lesson into how to take a history and do a physical.

"Being able to provide health care for our clients, many of whom are homeless and would not have access to care otherwise, is an affirmation of why I decided to pursue medicine in the first place," Stephens says.

Claire Hirschmann, a Yale graduate and experienced educator, begins volunteering as a coordinator at the Germantown youth and adolescent homeless shelter Covenant House. Regularly clad in her characteristic bright, outdoorsy plaid—matching her personality—she runs weekly activity nights and begins working in their health clinic, helping to take histories and beginning to glimpse what medicine looks like in low-resource settings.

Owusu-Agyei continues to volunteer at the Seventh-Day Adventist church in Philadelphia that she and her family have attended with other local Ghanaian immigrant families since her youth. As an undergrad, she coordinated activities for children, including helping the kids produce a play centered on helping those in need. As a medical student, she leads two classes built around camping skills, fundraisers, and community outreach. "It's like Boy Scouts and Girl Scouts with a religious twist," she says.

SUMMERTIME

As one of the community outreach coordinators for the United Community Clinic (UCC), another student-run clinic serving West Philadelphia, Chang helps plan the Bike Rodeo, UCC's annual health fair, in the summer after her first year. She also teams up with a classmate, Dan Zhang, to establish the Penn Med Symphony Orchestra. More than 40 medical students, other graduate students, physicians, and nurses answer their call and find time to attend regular rehearsals.

This summer—12 months into the 18-month preclinical curriculum—is the one truly independent summer Penn medical students get. Next year, and likely for the rest of their careers, they'll spend summers in the clinic.

Layne begins exploring an interest in quality improvement and patient safety research as a summer intern, and she loves it. She's working on data analysis for a project that aims to improve the rate at which eligible surgical patients receive blood thinners to prevent venous thromboembolism.

MUSIC AND MEDICINE: A HARMONIOUS PAIR

When it comes to cultivating a diverse skill set, Gina Chang is a pro. In addition to balancing her combined interests in pediatric neurology and public health, she is also a gifted musician. Launching the Penn Med Symphony Orchestra in the summer after her first year is only the beginning. Holding two annual concerts beginning in December 2016, the orchestra continues to expand with the addition of musicians from other medical schools, and it even holds a rehearsal with the professionals from the Philadelphia Orchestra. And Chang goes on to develop a medical school elective course with faculty from the Curtis Institute of Music, Humanism and Professionalism Through Music, and serves as a teaching assistant. The course aims to teach active listening and an appreciation for the ways in which disparate instruments—or health care professionals—can come together to create something harmonious.

"Learning how to identify different instrument sounds or understanding basic rhythm really can translate to medicine and patient care. It's just a different way of thinking," Chang says, adding, "there's a wellness aspect, too."

The elective is a hit, and post-course surveys also indicate an unexpected takeaway: Many students feel classical music in particular has become more approachable and understandable. Looking ahead, Chang hopes the course will continue to encourage students to broaden their horizons, develop new ways of expression, and learn to tackle problems in a multi-faceted way.

Gina Chang practices the cello at a rehearsal hosted by the Penn Med Symphony Orchestra with guests from the Philadelphia Orchestra in September 2017.

Mariah Owusu-Agyei first travels to Ghana, the country of her birth, during the summer after her first year of medical school. She begins a project assessing stroke risk in young children with sickle cell disease. She returns for a research fellowship after her third year.

Owusu-Agyei, meanwhile, travels to Ghana—where she was born—and begins working on a research project assessing stroke risk and interventions for young children with sickle cell disease.

Hirschmann spends the summer of 2016 interning in Washington, D.C. under the Assistant Secretary for Preparedness and Response, building on her interest in disaster relief and emergency medicine through a bird's eye view of preparedness efforts for the Democratic and Republican conventions.

The class's preclinical studies resume in the fall; it's back to the books and a deep immersion in the body's organ systems.

In December, the Penn Med Symphony Orchestra holds its first concert and earns a standing ovation.

INTO THE CLINIC

The start of clinical clerkships, for Layne and many others, is a thrill. "By engaging with patients directly—understanding their history, what kinds of symptoms they are having, and how those symptoms affect their lives—I feel like I'm learning so much more medicine than I ever did during the pre-clinical year and a half," she says.

Clerkship is a time when medical students learn to appreciate thinking about what a patient says and what their symptoms show, and to diagnose and develop treatment plans.

As rewarding as it is, clerkship year is also incredibly hard. Long hours compound the challenges of learning new skills.

"As you go through the different rotations you're essentially learning a totally different thing in medicine," Owusu-Agyei says. "Say you have rotation for a month. At the end of the month is when you feel most comfortable, but then you're starting something new!"

These struggles are just the beginning. Hardship and fatigue will be part of the job for years into the future as a resident and as an attending physician, Layne realizes. And so, as she spends more time in the clinic, she also periodically reflects on what has kept her energized along the way. She tells the story of her last day on rotation in the ICU when she almost teared up saying goodbye to an elderly patient and his wife, whom she often joined at the bedside and who'd told her how meaningful their interactions had been. "That happened on more than one patient interaction," she says. "Those were the little golden nuggets that get you through the worst parts. Those were my most fulfilling moments that I would go home and talk about, that motivated me to be more efficient or to learn other things upfront so I could make time for that."

Yet some challenges can't be addressed during a single exam, or even a single hospitalization. "Listening to patients' stories and realizing there's not much that can be done to help them because their medical issues are a very small portion of their overall problem has been a hard part of the year," Chang says. She has already been contemplating getting a master's in public health to broaden the perspective she will get with a medical degree. The scales begin to tip toward applying for the program.

MASTERY AND DIFFERENTIATION

Clerkship is a sample platter of many of the major clinical specialties. From January of their second year through December, medical students are not just learning, but also evaluating their preferences and fit in each area, and with each type of task.

In the midst of clerkships, McDermott finds surprises. Talking with patients about routine, clinically mundane health maintenance issues like eating right, exercising, and blood pressure, hadn't initially seemed particularly appealing to her: "This feels selfish to say, but there's not much instant gratification for a physician in that kind of counseling." She rethinks that attitude at the end of her family medicine rotation when she sees some patients return for a second visit. One woman, a recent immigrant who spoke little English, had initially come in with her daughter. She had high blood pressure. McDermott spoke with her about daily walking for exercise with her daughter, eating steamed vegetables, and eating less salt. Three and a half weeks later, she had lost almost 10 pounds and her blood pressure was lower. "She was so happy, proud of and excited by her progress," McDermott says, "and I was proud and excited, too."

But McDermott is at least as surprised to love surgery, surprised to see the continuity of care in surgery and the quality of doctor-patient relationships. And she's impressed by the speed with which a surgical procedure can turn a dire clinical situation around, as she recounts in the story of a woman who arrived at Penn terrified and barely able to breathe because of a large mass in her airway. "Within an hour and a half, she was taken to the operating room, the mass was removed, and she woke up breathing, talking, thinking, like none of it had ever happened. And she was so, so relieved."

That rotation clinches McDermott's decision: "From my first day in the OR, I felt there wasn't anything else for me."

As clerkships draw to a close, bewilderment slowly fades into mastery.

"It's remarkable how much you learn in the context of a year," Stephens reflects, in his characteristic soft-spoken and thoughtful manner. "It's not a perceptible moment when you suddenly feel comfortable in your shoes, but over time you start to feel like, 'I can do this.' I'm not going to be able to do it tomorrow or next week, but there will come a point in time when I can do this. This isn't this ethereal concept of being a physician anymore, it's actually something that I can reach. It's actually kind of incredible."

ON THE

Mallory Smith and
Sabrina Layne

OTHER SIDE OF THE GLASS

Sabrina Layne has spent enough time on clerkships to imagine what the people in scrubs are saying outside the sliding glass door: "This is Mallory Smith. She's a 25-year-old female with a history of cystic fibrosis complicated by *B. cepacia* infection. We are now post-op day five from a double lung transplant complicated by possible vocal cord paralysis." But today Layne is on the other side of the glass, on the other side of the state, in a surgical ICU in Pittsburgh. She is the best friend holding hands at the bedside, watching the pain in each of Smith's movements, helping the nurses move her, helping to toilet her, giving her tiny swabs of moisture on a toothbrush because she isn't allowed to drink.

Eight years earlier, when Layne and Smith were matched by the housing office as freshmen at Stanford, Smith seemed as outwardly healthy as a person could be. Six-foot-tall blonde, beachy, athletic, Californian Smith towered over the ultra-petite, curly-dark-haired, talkative New Yorker Layne. Though they appeared to be opposites, they instantly bonded. Layne quickly came to realize how much Smith's vibrant exterior belied the seriousness of her chronic illness. Smith spent hours every day in their dorm room doing inhalation treatments and wearing a percussive vest that pounded on her chest to prevent mucus buildup—often while she studied. During their sophomore year, Smith's illness began to worsen, and Layne often sat at Smith's bedside as she was in and out of the hospital for their remaining college years. Layne was sometimes a sounding board to Smith's frustrations with the medical system when nurses wouldn't allow her to administer her own medicines or when her parents and doctors disagreed over treatment plans. But, mostly, they were just regular best friends—studying together, gossiping about boys, and laughing at inside jokes and goofy nicknames that Smith coined for Layne, like Sabra-bra, Sabrizz, and Sabrizznatch.

Even when Layne departs for med school on the opposite coast, she visits Smith as often as she can. During one trip early in Layne's second year, Smith explains for the first time the implications of her *B. cepacia* infection, a serious complication that typically makes patients ineligible for lung transplants. On the flight back to Philadelphia, Layne cries, but not because of *B. cepacia*. It's because Smith's illness had progressed so much since her last visit. They hadn't explored San Francisco. Their big outing was a short walk down the block to get manicures and pedicures; they got an Uber ride back to Smith's apartment because the slight incline of the street was too challenging. Layne trailed behind Smith, carrying her oxygen tank up the stairs.

The visits slowly shape Layne's perception of illness and health. One visit to the doctor's office, or one hospitalization, never shows the medical provider this long view—the lowering of a day's expectations from surfing to mani-pedis, the chronic challenges with both a weakening body and with the medical system.

Over the next year, Layne visits Smith three times at the University of Pittsburgh Medical Center. Once while she is listed for transplant, against the odds. Once just after the surgery, when she sits at her bedside in the SICU. And once at the end.

Smith is intubated, partially sedated, and her organs are beginning to fail. Layne is one of a crowd of close friends who circle the bedside then—joking, laughing, and trying to convey hope despite the grim prognosis. Smith's father, Mark, has begun rallying researchers across the world in a last-ditch effort to develop phage viruses that may destroy the newly virulent, antibiotic-resistant *B. cepacia*. By the time they inject Mallory with the experimental phages, her infection has advanced too far. Three days after Layne has returned to medical school, knowing that she has held her best friend's hand for the last time, she learns that Smith has died.

More than a year later, Layne still thinks about Smith almost every day on the wards. When patients are struggling, when families have conflicts with clinicians, she sees echoes of some of her friend's experiences. "Even in moments where people on the team are starting to get frustrated with a certain patient, I find myself thinking, 'What would that have looked like from the other side?'" She is resolved to carry that perspective forward as a physician, whether that means giving a family a few extra moments to process their feelings, or pausing to try to communicate in a different way.

On March 14, 2019, the evening before Match Day, Layne stands before an assembled crowd of classmates and professors to talk about these lessons she's learned from Smith alongside others who knew her intimately—a number that is poised to grow. Diane Shader Smith has carried out her daughter's wish to publish her journals. The newly released posthumous memoir is entitled *Salt In My Soul: An Unfinished Life*. Profits from its sale will benefit research into phage therapy.

Layne keeps her poise as she introduces Diane and Mark for their talk about Mallory and her memoir, but the emotion cracks in her voice. "I can still hear Mallory laughing as she called me by those nicknames," Layne says. "I will never forget them. I will forever treasure our special friendship. I'm grateful now that Mallory left us her words, her gift."

IMPACT, AUTONOMY, EXPLORATION

"There's nothing quite like the end of a person's hospitalization when they are thanking you for being there for them," Owusu-Agyei says, in the midst of a sub-internship in internal medicine at the Corporal Michael J. Crescenz VA Medical Center. "Just yesterday, I called my patient's daughter, his power of attorney. She said she was very happy to tell other people that this was the first time [in many hospitalizations] her father had a black female doctor. It made her feel so proud, it made her want to tell her kids, and she has other people in her family who are thinking of going into medicine. That really touched me."

The VA sub-internship, or "sub-I," is a popular choice, as post-clerkship students take electives in specialties they haven't experienced before, or seek more hands-on experience in broadly applicable disciplines like internal medicine. It's the time to make a choice—or to strengthen one's preparation for choices already made—for a future specialty.

As he sets sights on a dermatology specialty, Stephens crafts his sequence of electives to build the strengths he'll need. He follows the sub-I with a dermatology elective, a pediatric dermatology rotation, and electives exposing him to conditions that overlap with dermatology including rheumatology, hematology/oncology, and infectious disease.

The eight-hour test that constitutes "Step 1" of the U.S. medical licensing exam is a major hurdle after clerkship year; each student has a strategy for when to take it. Layne and Owusu-Agyei are among those who opt to take it early, studying in the fall, then turning their attention to clinical electives, which both are relying on to help them narrow their broad interests in a lot of specialties. McDermott takes it later, disappearing into a self-described "Step 1 hole" of intense studying the following spring.

Hirschmann enjoys electives in adolescent medicine and family medicine. She later takes an elective in family planning and an away rotation in emergency medicine at the renowned program at Highland, in Oakland, Calif. It's a county program focused on the safety net hospital for Alameda County, and Hirschmann starts thinking about how reproductive health can be addressed in the context of emergency care.

SCHOLARLY PURSUITS

The fourth year of medical school not only offers a continuation of elective rotations; it's also the time when students at the Perelman School of Medicine must branch out into a so-called Scholarly Pursuit—at least three months spent on a hypothesis-driven project under the guidance of a mentor.

As Stephens works toward a career in dermatology, he finds multiple research projects that pique his interest. For one, he teams up with pediatric dermatologists at CHOP to better understand the clinical context—and potential impact—of a new teledermatology platform they are piloting. For another, he partners with melanoma researchers working to better predict which patients will respond best to immunotherapy drugs.

Labora, long committed to health equity and compassionate care for women's health, has a "totally out of left field" experience beginning a basic science project this year investigating how statin drugs for cholesterol management impact the immune system. She has never held a pipette before this.

For Hirschmann, a scholarly pursuit dovetails with working on a certificate in medical education. A devoted educator since before medical school, her journey at Penn has in-

LEAVING NO PATIENT BEHIND

In her first two years of medical school, Katie McDermott develops an interest in a subset of patients whose needs remain largely unmet: incarcerated individuals. She joins both the Correctional Health Initiative student interest group and a working group with students from five classes, spearheaded by a then-MD-PhD student, Nick Iacobelli, to develop a curriculum for a medical school elective course. In time, this group not only establishes a relationship with the Pa. State Correctional Institution at Phoenix/Graterford, but also develops a curriculum focused on inmates' health characteristics and opportunities to improve care delivery across settings. The elective course is designed for students to work with patients in chronic disease clinics at the prison, including those providing mental health services, to perform minor procedures at the prison infirmary, and to pursue an independent research project related to correctional health. While the course is in early stages of development, McDermott is determined to provide students with an opportunity to serve vulnerable populations, impact health policy, and develop as leaders in an oft-forgotten realm of medicine.

"Correctional health is an area of major medical-social need across all disciplines," McDermott says. "Within the surgical community, for example, there is increasing recognition that this population does not receive routine surgical care, even in many cases of urgent surgical problems." It's a unique environment and a uniquely challenging one for medical care but, she says, it's critical to acknowledge that change is both necessary and possible.

Katie McDermott

cluded working as a teaching assistant for anatomy, doctoring, and microbiology and infectious disease courses. This work with first-year students encourages her to create an elective for all class years focused on leadership—a skill she recognizes is vitally important in medicine, yet is not overtly built into the core curriculum at Penn or most other medical schools. It's a way of sharing what she sees as her own strength as a leader: "One of my favorite things is watching people do things they're good at, and telling them that, and trying to find specific things to identify about who they are and why they are wonderful in the world."

EMPOWERED STUDENTS EMPOWER OTHERS

While Chang continues to play in the orchestra, she also partners with a community organization called Play On, Philly! that provides free music education to students in Philadelphia who are not otherwise able to receive music lessons. Through the partnership, the students get to play in a Penn Med Symphony Orchestra concert.

Chang is also a coordinator at UCC after two years of volunteering, helping to organize other upperclassmen volunteers and sending them teaching materials to use in mentoring younger students. At UCHC, Stephens is now the mentor. As a volunteer and an educator, Stephens applies the skills he has developed and his advanced perspective to help first- and second-year students make their own leap into clinical care.

"It's a neat experience to still be involved in patient care, but also have that added component of mentoring first- and second-year students and helping them learn lung sounds and how to take a history," he says. "It comes full circle—you start off relying on others to find your way through, and then you eventually get to a point where you have some knowledge that you can pay forward what's been invested in you."

Stephens also embraces other opportunities to educate, including by serving as a chief anatomy TA for first-year students during his fourth year.

After excelling in a bedside ultrasound elective, Labora is invited to teach first and second-year students how to perform right upper quadrant ultrasounds, echoes, and first trimester pregnancy scans. Developing a broader perspective of how ultrasound is applied outside of OB/GYN in

Amanda Labora

EQUAL TREATMENT

Regardless of setting, Amanda Labora never loses sight of her aim to learn from the experiences of others and to share the voices of patients, colleagues, and communities.

By the midpoint of her second year, she and a classmate, working with Associate Dean for Diversity and Inclusion Horace DeLisser, MD, develop an educational initiative they call Equal Treatment. Through an online platform, it provides free evidence-based resources to increase awareness of issues and practices that negatively impact the health outcomes of people of color, undocumented immigrant patients, and incarcerated individuals. The robust online curriculum provides students and providers with the tools to identify health care disparities, recognize the factors that perpetuate systemic inequities, and advocate for patients.

Eager to collaborate with champions of racial justice across disciplines, Labora and her co-founder connect with a documentary filmmaker, a pedagogical expert and ethnic studies scholar, and the *Doctors Who Create* podcast. They reach out to communities affected by the inequities they are educating about, making space for these groups to direct the conversation. With pro bono legal assistance, they formally incorporate Equal Treatment as a nonprofit organization in Pennsylvania and federally as a 501(c)(3). As her residency approaches, Labora is confident that the organization will continue to evolve and promote health equity through education.

"My co-founder, Hattie Huston-Paterson, and I are going to continue this work for years to come, even while we're busy in residency. It's an exciting time to see how Equal Treatment can grow and what partners we can identify at other institutions," she says. "The goal is to engage a clinical audience, inspire them to be passionate about these issues, and provide them with materials to educate and empower their colleagues. This is an integral part of the clinical work we do, and it's a lifelong commitment for me."

specialties such as emergency medicine, and getting the opportunity to share it with her younger peers, are things Labora knows she will carry throughout her career. She also begins volunteering with a women's refugee clinic.

McDermott, embracing her interest in surgery, finds opportunities to lead at the Agnew Surgery Clinic, a community clinic that provides patients—many of whom are uninsured, underinsured, undocumented, or homeless—with easier access to surgical triage on a monthly basis. As the clinic's community outreach coordinator, McDermott works to increase referrals, communicates with other student-run clinics and ED residents, and liaises with the community to make sure populations who could benefit from the clinic's services know it exists. McDermott is deliberative in her word choice—she wants to be sure that what she says is what she truly means. So her comment is emphatic: "This clinic has definitely been the most meaningful extracurricular in which I've been involved during medical school."

The experience inspires her to pursue an additional degree during her residency, potentially in public policy or health systems.

GLOBAL VENTURES

Chang returns to campus in the fall of 2018 after spending her final third-year clinical elective rotation in Botswana. Then she begins her own additional degree right away—a master's of public health. While many of her original classmates are now beginning their fourth year of med school, she is diverging on a different path. "I've always wanted to practice clinically while also doing public health research," she says. "I wanted to learn how to design projects and run them from the beginning, how policy works, how health systems fit into the larger public health realm… It gives me the chance to practice thinking in different ways."

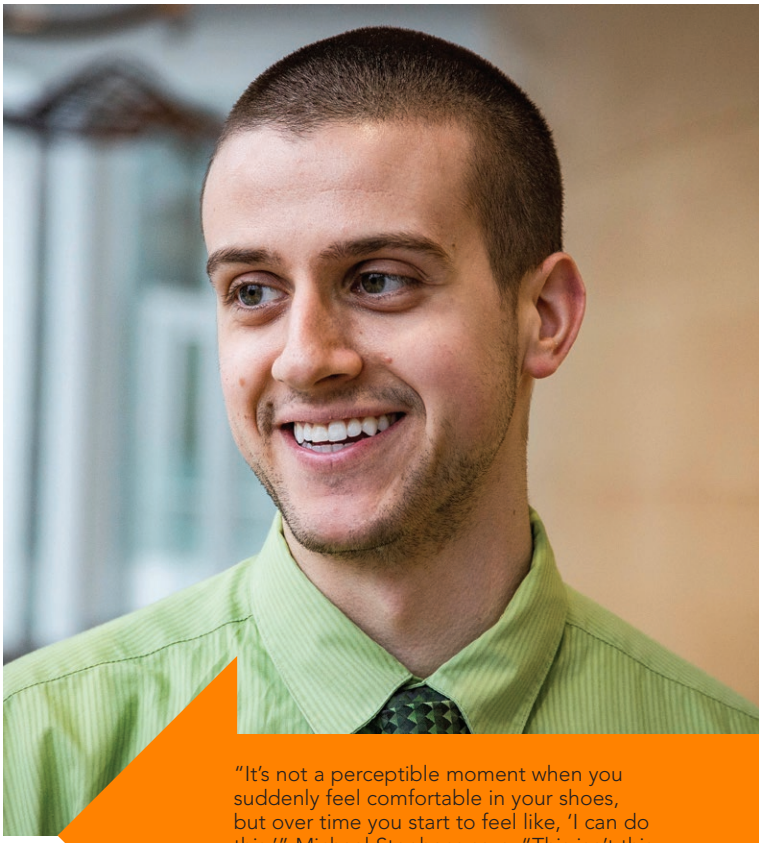
Owusu-Agyei, too, follows a unique path this year—back to Ghana on a research fellowship. After spending a year out, like Chang, she will graduate from medical school in 2020. She divides her time between clinical work at the HopeXchange Medical Center in Kumasi and nonstop research, with projects on sickle cell disease, on compliance with malaria treatment guidelines, and on skin bleaching. The latter topic lines up with a specialty she's now seriously considering: dermatology. "A lack of access to dermatology clinics can mean physicians don't see many black patients, and that leads to a lack of knowledge of how to treat their conditions," she says. "I'm interested in getting that exposure, diving deeper into this issue, and seeing more black skin pathologies."

Still, she is also eager for the project be wrapped up after months of hard work so she can take some time to explore. Joining a local church is her major extracurricular venture. It helps her feel connected to the community.

"Honestly, I don't miss medical school at all," she says, laughing. "My experience here has been more than rewarding, and I'm really happy that I took the time to come here and continue the journey in a different way. I still feel like I haven't had the chance to explore everything or definitively pick my specialty, so this extra time has been really valuable to me."

APPLYING AND INTERVIEWING

For the rest of the class, residency applications loom as a dominant concern as the fourth year begins—along with Step 2 of the medical licensing exam. Applications submitted, they wait. Then the interview opportunities come in—and it's time to act.



"It's not a perceptible moment when you suddenly feel comfortable in your shoes, but over time you start to feel like, 'I can do this,'" Michael Stephens says. "This isn't this ethereal concept of being a physician anymore, it's actually something that I can reach."

Layne is sitting in the dentist's chair when she receives her invitation to interview at Penn—where she is eager to stay. Luckily, she has set up a dedicated email account for her residency applications and set it to forward all messages to her boyfriend, just in case she doesn't see them quickly. He calls her as soon as he sees it. "The sucker is in my mouth, and I'm saying, 'Sorry, I have to take this,' and I pick up the phone and it's still in my mouth and I'm drooling all over myself," she recounts.

By now, Layne has an eye toward later specializing in either cardiology or gastroenterology after a residency in internal medicine. She wants to find a program with opportunities for residents to do QI work, and she wants to stay in

ADAPTING TO THE UNEXPECTED

Claire Hirschmann (right) hoists a classmate who has successfully tied secure knots.

or near Philadelphia; the boyfriend who so helpfully called her at the dentist's office is a PhD student who is committed to staying here for at least another three years. Layne trusts her parents as a vital sounding board throughout her application and interviewing process. Both physicians, they listen to Layne's thoughts about the pros and cons of each program where she interviews. They also urge her to take the hardships of a potential long-distance relationship seriously: They know them well, having matched for residency in different cities before Layne's mother transferred programs after her intern year.

Still, as Layne interviews at a number of programs across the northeast, she finds there are many where she could be happy to continue her training.

It's cold, damp, and windy as a group of medical students waits to test out the strength of their knots. One by one, they're hoisted off the ground by their classmates to determine their success. If they've wrapped the webbing around their legs securely, they'll swing safely in their makeshift harness. If not… Well, at least it's not too muddy. All the while, Claire Hirschmann, their perpetually plaid-clad teaching assistant, offers encouragement as they make adjustments and praises them for their "awesome team work!" Though it might look odd to a hiker passing by, this is all part of the intensive, two-week Wilderness and Disaster Medicine elective.

Hirschmann's medical school experience is characterized by being both a pupil and a teacher, a listener and a leader, a peer and a preceptor. Before arriving at Penn, she regularly led backpacking trips, was certified as a Wilderness First Responder, and founded The Field Academy, a traveling high school program in Maine that combined academics with immersive, place-based education. Upon arriving at Penn, she immediately recognizes the elective for fourth-year students as the perfect outlet for her combined outdoor, education, and medical skills, and she begins working with course instructor Peter Sananman, MD. In her fourth year, while her peers enroll as novices in the class, she takes on the responsibility of coordinating the students, logistics, and gear. And she takes an active role in helping her classmates develop a more diverse physician's toolkit—even in situations when actual tools are hard to come by.

While students may never find themselves treating snake bites, working in disaster areas, or performing lifesaving measures without access to a sterile environment and a team of specialists, Hirschmann is committed to teaching preparedness, rapid critical thinking, and innovative improvisation—all of which are key in any clinical setting, especially when dealing with a rapidly changing case or unexpected obstacle.

"The course is very outdoor-skills-based, but it has so much to do with trusting your instincts, believing in your creativity and resourcefulness, and understanding that there's not one way to do medicine," Hirschmann says. "The goal is to emphasize that even in austere environments, there's a way to take care of someone in need—you just need to use whatever resources you have to do the best you can."

For many, the process is also grueling. Labora spends only two nights in Philadelphia during November—but thanks to the Perelman School of Medicine's alumni host program, she only stays at a hotel once and relies on loans less than she'd expected to finance her interview travel. When interviewing at UCSF in San Francisco, a stay with the school's vice dean for medical education, who is a Penn alumna, is a powerful and meaningful experience for Labora to connect with a potential mentor. "She welcomed me into her home and shared her own interesting career path," she says.

For Hirschmann, applying in emergency medicine, people are the most important ingredient. "You could be crawling out of your sleeping bag to adjust a tent in the middle of a rainstorm, and it could be the most fun activity you've ever done in your life," she says. "Even if it's pouring, even if it's midnight, doing it with someone who sees the fun in it can make a miserable experience extraordinary. Similarly, in whatever residency program I end up, I'm looking for a place where I feel like the people are going to make me excited to be where I am. Even when it's really hard, even when I make a mistake, even when I feel like I'm the worst doctor in the world, there are going to be people around me who know me and trust me enough to make me see and become the best version of myself."

She is excited about the relative newness of emergency medicine as a specialty; it's something she sees as "permeable" and infused with creativity, as clinicians map new ground for addressing the opioid epidemic and other challenges that intersect with emergency care. Hirschmann herself wants to explore how the specialty can address reproductive health issues. "I want to be at a place where the outlook of the program is that there is a lot of possibility in what we do," she says. "The world is big, and we have so many opportunities to effect change within it."

MAKE ME A MATCH

On March 15, 2019, anticipation is in the air at JMEC.

Layne has kept her nerves at bay up until this point by planning for an event last night honoring her best friend; today she is trying to have only happy thoughts. Today is the day she will learn if she can stay in Philadelphia to train in internal medicine.

Stephens arrives at JMEC moments before the ceremony and is absorbed into the swarm of excited friends, eager to know where he will go for dermatology.

At noon, it begins.

"Class of 2019, we are so proud of you!" Senior Vice Dean for Medical Education Suzanne Rose, MD, MSEd, says to the cheering crowd.

"We know you're anxious, super excited, but we also want you to be present," says Dean J. Larry Jameson, MD, PhD. "Be present because this is a day you'll remember for a very long time. We prepared you well at the Perelman School of Medicine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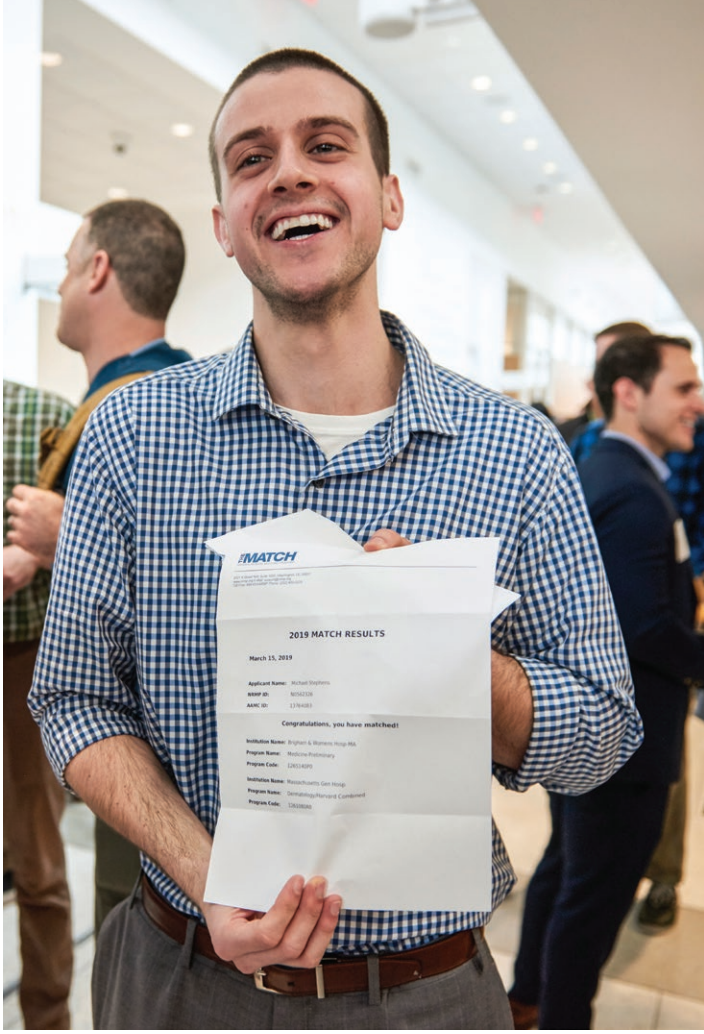

MATCH
2019 MATCH RESULTS
March 15, 2019
Congratulations, you have matched!

for this next phase, and you're going to represent us incredibly well as you go on to your internship and residency."

Hundreds of students and their families and friends fill the rows of chairs facing the atrium stage overlooking the Philadelphia skyline. Hundreds more crush together in the space behind, as far back as the elevators. In this packed zone, too far back to see even if she were taller, Layne waits with her parents and boyfriend.

Chang, taking a break from her MPH studies, stands a short distance behind, cheering for her classmates. She and Owusu-Agyei will be back here in a year's time when both will finally meet their own matches—Chang's in pediatric neurology, Owusu-Agyei's perhaps in dermatology, but for now she's still in Ghana and glad to have some extra time to decide.

Hirschmann is a short distance away, dressed in her "nice plaid" for the occasion. She's feeling nervous excitement she compares to a track meet. Each person may be running individual races, but the whole team is there, anxious to see how they'll all do. She'll find out today where she will hone her chops in emergency medicine. The day has personal implications, too. She's couples matching with a Penn classmate, Billy Maes, who will specialize in family medicine.

McDermott is couples matching, too—but she isn't here today. Her partner attends medical school hundreds of miles away, at Brown University in Providence, so she has joined his Match Day ceremony there to find out where they will go together.

Soon Layne weaves her way up to the stage to get her envelope, knock-kneed with nerves. Once she has the envelope, it hits her that the answer is in her hand, and she begins shaking. She navigates back to her family through a gauntlet of hugs from excited friends—even though none of them know what is inside that envelope yet.

One by one, Hirschmann, Layne, and Labora—each with their respective partners—dash down a hallway to quiet corners in JMEC to open the envelopes. Hirschmann and Maes open theirs simultaneously. In Rhode Island, McDermott and her partner do the same. As he opens his envelope, Stephens's hands are shaking so much it takes him about 30 seconds to break the seal.

When Labora sees her match, tears start streaming down her face from the release of all the emotion; when her parents catch up, they can't tell: "Good tears or bad tears?"

NEXT STOP: EVERYWHERE

They are good tears. She is incredibly happy to have matched at UCSF.

Stephens, McDermott, and Hirschmann each feel the same about their matches.

Stephens, who had no idea where he'd end up ("The way I ranked my list, you really could throw a dart at a map of the United States and that's where I would be going") will move to Boston for residency. A bonus: Even though dermatology programs are commonly split between the intern year and specialized dermatology training, he doesn't have to move twice. He'll do his preliminary year at Brigham and Women's Hospital, followed by the combined Harvard dermatology program.

McDermott is going to Johns Hopkins for her surgery residency. Her boyfriend matched at Hopkins, too, for pediatrics, so they will finally get to be together after four years apart. (They met during their post-bac program and began dating in the year after that, but weren't accepted to any of the same medical schools.)

Hirschmann is beaming and seems grounded and calm. She's headed back to Highland Emergency Medicine, the renowned program in Oakland where she did an away rotation in her third year and clinched her choice of specialty. "I love it because the providers I met there are dedicated to the population they serve in a way that felt real and genuine, and felt like the kind of people I wanted to be around, to learn from, as I train," she says. "It was the ethos of the place and the sense of camaraderie and community they have. I felt like I was home when I was there, and so I'm really excited to call that home now."

When Layne unfolds her letter, she immediately starts bawling. It's her top choice. She's staying at Penn. When she returns to the crowd, she can barely move for all the hugs she receives from friends at every turn—some lifting her up to spin her around.

Later in the day, Layne reflects. "The more that I talk to people, the more I hear that amazing people are staying. That's one of the most exciting parts. Because Penn is our home program, and so many departments are great, so many people across specialties stay. It feels so comforting to know that when I'm calling an ENT consult, it's going to be my friend picking up the phone. Even walking down the hospital halls when you're super tired and stressed, when you see people you know and they wave and smile, it makes your work environment feel friendly and like home." ▽

Read this story online with related links at PennMedicine.org/magazine/path

THE NEW LEADER'S LANDSCAPE

By Christina Hernandez Sherwood
Illustrations by Graham Perry

What it takes to achieve promotion in academic medicine—being a highly regarded clinician and accomplished researcher—is no longer enough to lead.

"If you asked me, 'What's the first thing you're going to do when you take this job?'" said Mitchell D. Schnall, MD'86, PhD'86, GME'92, chair of Radiology at Penn Medicine, "it would not have been in a million years: Figure out how I can communicate with my department. It should have been."

Schnall became department chair in 2012, just as dramatic changes in the industry were putting pressure on his specialty, while other changes, such as advancing artificial intelligence systems, offered new opportunities. The catch: the 180 faculty in the department needed to think about their practice in a whole new way. Without formal leadership training in change management, he turned to the Penn Medicine Academy for help steering his department through a time of transformational change.

He was not alone in recognizing the shifting landscape—not just in the practice of radiology, but in the leadership challenges of academic medicine.

Today's leader faces a far more demanding set of expectations than the archetypal leader in academic medicine in the past, who gained tenure and promotion through excellence as a clinician and researcher—often without any assessment or training in specific leadership skills. The modern leader is expected to shepherd her colleagues through the digital revolution, leading change in the brave new world of electronic health records and artificial intelligence, precision medicine and targeted therapies. That calls for understanding hospital finances and the complex regulatory and reimbursement landscape. She must also be comfortable having difficult conversations with faculty who are struggling and holding others accountable. And, of course, she must still practice medicine, conduct research, teach, or do some combination of all three.

Yet as the challenges faced by leaders in academic medicine are growing, so too are the opportunities to make progress. The Department of Medicine, Penn Medicine's largest clinical department—it is home to more than 625 faculty—recently

completed its first Enhancing Leadership program, a two-year effort to train its division chiefs and other senior faculty in the fundamentals of leadership. Last year, Radiology embarked on a three-day immersive retreat focused on leading change—resulting in Schnall's revelation about the importance of communication.

And, most notably, this year the Perelman School of Medicine launched a new program for academic medical leaders beyond the Penn Medicine community. Leadership in a New Era of Health Care is a partnership with Wharton Executive Education and included a personalized, four-day program designed for today's chief executives, chairs, chiefs, deans and other types of administrative leaders in health care. "The evolution of the executive leadership program really mirrors the need to have more leaders in medicine, both academic medicine and medicine more generally," said J. Larry Jameson, MD, PhD, executive vice president of the University of Pennsylvania for the Health System and dean of the Perelman School of Medicine, who spearheaded the initiative with Caryn Lerman, PhD, the former vice dean for strategic initiatives. "And, in part, this reflects the changing landscape of health care."

Jameson and Lerman first delineated the challenges facing modern health care leaders in a perspective in the *New England Journal of Medicine* last year. The program in partnership with Wharton Executive Education was just one of Penn's approaches to a much broader need they described as "a persistent and worsening disconnect between the capacity of the physician-leadership workforce and the needs of our expanding and increasingly complex health systems."

New leadership roles in academic medicine are developing that simply didn't exist a few years ago, Jameson said. The field needs leaders who can oversee quality improvement activities and clinical service lines across specialties, to have experience in health care disparities and in information technology. "Most people and most health care organizations haven't thought in a strategic way about the need to develop a parallel skill set in leadership training," Jameson said. "In the manufacturing sector or other industries these have been in place and maturing for a longer period of time."

This is perhaps partly due to a stigma in academic medicine around leadership development or coaching, Jameson said. "Ten years ago, people would view this almost as though it was a punishment or you were having to do something because of a deficiency," he said. "That's changed. Most people now see it as a value add, a very positive thing."

Assessing Leadership Skills

Leaders in any field need a sense of their strengths and weaknesses before embarking on improvements. The Department of Medicine began its program with each member of the leadership team, including division chiefs, completing a private self assessment of their leadership competencies, said Michael S. Parmacek, MD, the department chair. The assessments were used to help tailor the program, which consisted of a full day of classroom training, monthly three-hour meetings over two years, and assigned reading and homework.

The assessments were also used to define more than two dozen core competencies for leaders in academic medicine, such as managing difficult faculty and negotiating, said Cindy Morgan, Penn Medicine's vice president for learning and organizational development, whose Penn Medicine Academy worked closely with the Department of Medicine on the leadership program. "In the days of old, there was the expert with the great CV that got promoted to chair or division chief," she said. "[Now leaders need] the street cred to influence clinicians, educators and researchers. They also have to have leadership skills and a certain level of comfort with uncertainty, ambiguity and complexity."

Lynn M. Schuchter, MD, chief of the Division of Hematology and Oncology, said her assessment showed she needed to improve her skills around delegating and setting expectations. But perhaps more critical for her was learning to understand and assess leadership capability in others. "There would be a situation where I have a faculty member who is leading something who isn't able to delegate, or is too much in the trees and not seeing the big picture," Schuchter said. "How do you help the faculty member change?"

Each division chief was matched with a coach, and Schuchter, paired with Morgan, performed a comprehensive talent assessment of the majority of her faculty, with a focus on those in leadership roles. Struggling leaders were then paired with their own coaches to work on skills such as running effective meetings. She called the results "transformational."

Creating Communities of Leaders

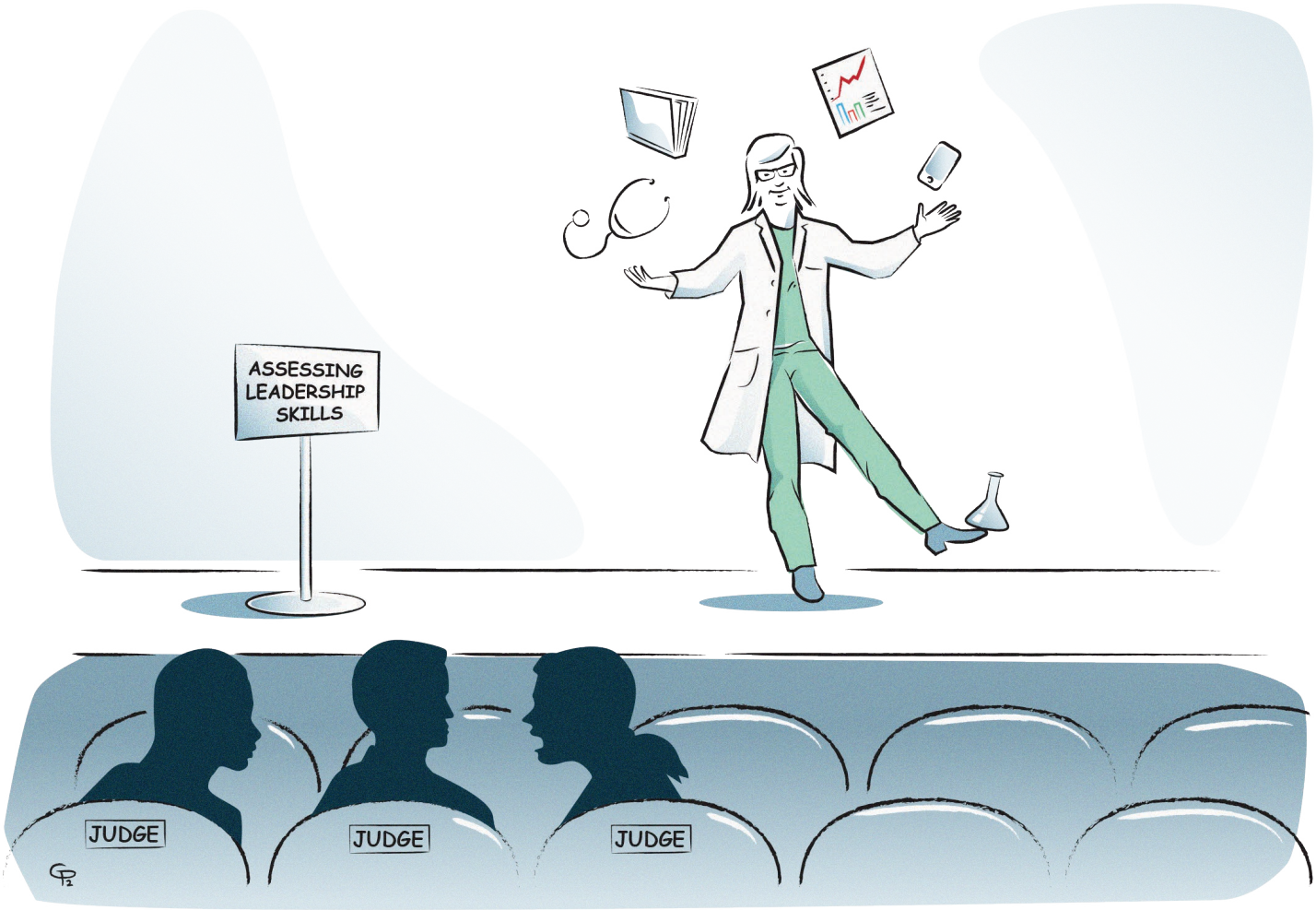
In some of the Department of Medicine's leadership program sessions, participants shared real-life examples from their day-to-day lives as leaders: situations including personnel problems, financial quandaries, programmatic development issues and more. They worked together in

that safe environment to solve these problems, many of which were shared across divisions. "People were brave and courteous and earnest," Schuchter said. "We learned a lot from each other."

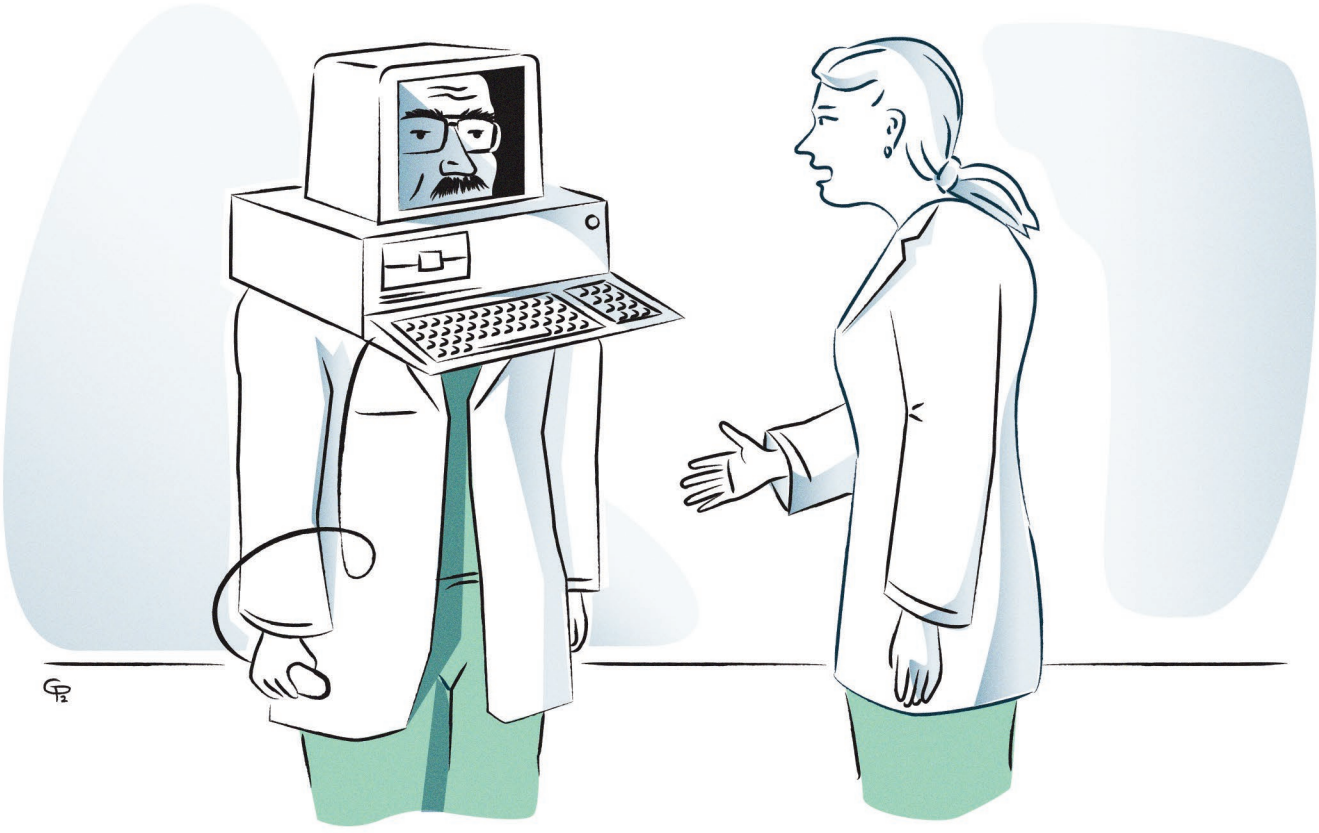
Thomas P. Cappola, MD, ScM, chief of the Division of Cardiovascular Medicine, called this new community the leadership program's most valuable product. "We became much more comfortable calling each other with similar challenges," he said. "You can feel alone in this job because everyone comes to you with problems and they don't always tell you whether you're solving them the right way. This provided a sounding board for situations like that."

Cappola introduced the same type of leadership community to his division, a group of 144 cardiologists, up from 105 when he took the helm in 2015. The sheer size of the division required a team to share the load, Cappola said, and a chief who would hold them accountable. The division has different sections, each with its own leader, and Cappola established executive committee meetings to bring them together regularly for problem-solving conversations.

"In the past, individual programs or divisions often operated in a vacuum and didn't consider the value of strategic partnerships," said Jason Christie, MD, MSCE'02, chief of the Division of Pulmonary and Critical Care Medicine, reflecting on the Department of Medicine program. But, he said, working together and with leaders who are transparent about finances can lead to better decisions. Better understanding of sound financial principles through the leadership training has yielded results beyond just better collaboration, he noted. Now, he said, this knowledge can help ensure that a change, whether it's a new hire or a new research or educational initiative, is sustainable.



"I can see she can multitask, but can she run a meeting?"



"I don't think that's quite what we meant by a digital transformation, Bob."

Leading Transformational Change

It was during a three-day retreat for Radiology's leaders in September facilitated by Morgan's Penn Medicine Academy team that Schnall learned that he and his fellow leaders should focus on communicating with the department. The faculty needed to learn that pressures from reimbursement rates and time demands render the current, individualized mode of practice unsustainable.

From there, they could pilot test opportunities. For instance, in order to take advantage of new artificial intelligence technology the department is using in collaboration with an industry partner, Schnall said, everyone must agree to report nodules similarly. If individual clinicians used different language and recommendations, they would render the system moot. "The challenge is to balance the respect for the traditions that have made academia revered and successful over the years with the practical needs of large dynamic health systems and all the business pressures put upon them," he said. "Getting that balance right and convincing all constituencies that you have respect for their position in the organization is really critical."

Leadership's Many Faces

The overarching leadership challenges of academic medicine are largely the same in both clinical and non-clinical departments, said Lisa Bellini, MD, GME'94, senior vice dean for academic affairs. But, she added, the domains are different for those whose charge is focused, for example, on basic science or medical education. For instance, financial conundrums in clinical departments revolve around issues such as health care reimbursement and physician productivity. For leaders overseeing basic science teams, top financial priorities are securing funding and grant management.

Of course, there are some challenges unique to non-clinical academic leaders. "The phenotype of traditional chairs and center and institute directors were really very internally focused and less externally focused," Bellini said. "Now, it's changed so much that you need to be both." That external environment includes the National Institutes of Health, the Association of American Medical Colleges and other national societies and private foundations that provide substantial research funding. "It really does take a set of skills that are not necessarily intuitive for people," Bellini said. Leaders in medical education, she added, face the challenge of serving as 24/7 role models for professionalism in the learning environment.

A diverse set of leadership training opportunities offer lessons for faculty leaders of all kinds. Advance, an umbrella program of Faculty Affairs and Professional Development, is designed to teach skills and competencies to Perelman School of Medicine faculty based on their interests, Bellini said. The program includes teaching excellence, career management and mentoring. Launching this July is the Program

to Advance Clinician Educators (PACE), which will aim to arm recent hires with an understanding of the resources available at Penn for them to be successful.

Other training opportunities empower leaders to advance equity, diversity, and inclusion. FOCUS on Women's Health & Leadership at the Perelman School of Medicine holds monthly sessions for both women and men on leadership-related topics, such as conflict resolution and negotiation strategies, plus hosts an annual conference on women's professional development. Penn's Office of Inclusion and Diversity provides training on unconscious biases and how to mitigate them for members of hiring search committees. Bellini herself has been through the workshop more than once. "No matter who you are," she said, "you have biases that you may not appreciate."

> Leadership in non-clinical areas now requires engaging externally more than in the past. "It really does take a set of skills that are not necessarily intuitive for people," said Lisa Bellini, MD, GME'04.

Handling Difficult Conversations

Doctors might be accustomed to having difficult conversations with patients, but talking to colleagues about their shortcomings is perhaps a trickier endeavor. That's especially true when the conversation is with a challenging, or difficult, personality. There's the person with the "narcissistic" dynamic, whose ego gets in the way of the greater good, and the "bean counters," who are known for their controlling and micromanaging behaviors. "That was an area where many of our division chiefs, and I, would struggle sometimes in how you approach, communicate with and change the behavior of valued, but also challenging or difficult, faculty members," Parmacek said.

Enter Jody J. Foster, MD, MBA, Penn Medicine's assistant dean for professionalism, chair of Psychiatry at Pennsylvania Hospital, and author of *The Schmuck in My Office: How to Deal Effectively with Difficult People at Work*. It's common in any high-stress field for people to regress to what Foster calls their "less appealing selves" and act impulsively. Unchecked, hot tempers can lead to interactions rife with misunderstandings and miscommunication. It can happen anywhere, even among highly accomplished and talented teams. Fosters says faculty are eager for a framework for having uncomfortable conversations. They want to learn how to get at the underlying issues causing the problem, and how to mitigate them.

In the instance of a one-time aggressive interaction on the floor or in a meeting, Foster's advice is surprisingly straightforward: start by talking to the transgressor. Talk through the situation and try to determine the underlying cause. "A lot of correction of bad behavior is accomplished by simply directly outlining the bad behavior," Foster said. "What we do as a culture is we note it, we get upset by it and then we talk about it, but we don't talk to it."

Industry Experts

As a physician academic herself, it wasn't a heavy lift for Foster to draw her examples from the world of academic medicine. But key to the Department of Medicine's leadership program was that every consultant who led a presentation for the group was either part of the Penn Medicine system or educated on the world of academic medicine to ensure they were speaking in the language of their audience, Morgan said. Wharton professor and corporate finance expert Joe Perfetti, for instance, used the Department of Medicine's balance sheet in his financial presentation, pointing to several divisions as exemplars.

"We know physicians," Morgan said. "They don't want to learn from a generic case study. They don't want to have different industries being metaphors for what we do from a leadership perspective here. They are much more practical and concrete. They want to be in scenarios they are going to be facing… We built the program and customized it to hit that need."

The Perelman/Wharton program launched this spring, Leadership in a New Era of Health Care, was similarly tailored to its audience of clinicians and medical directors, professors and deans, program managers and department chairs who traveled to Philadelphia in late March from health systems across the country. Faculty speakers included management and operations experts from Penn Medicine and Wharton. A follow-up program, Health Care Innovation, meant for senior-level clinicians and health care executives, was held in late April.

Physicians, by simply choosing the field and by the training they receive in medical school, are primed for leadership, Jameson said. They are good listeners who are tuned into reading the verbal and nonverbal communications of patients and families, and who frequently communicate with their colleagues, often in teams. "We're, in general, in good shape to be effective leaders," Jameson said, "but it doesn't mean you don't work on formal training and continuous improvement." ▽

Read this story online with related links at PennMedicine.org/magazine/leadership2019.

A COHORT STUDY COMES OF AGE

Over nearly two decades, a major national study of kidney disease led and coordinated at Penn has defined key risk factors in an all-too-common silent epidemic. And the way its scientists make discoveries has grown up along with the study itself.

By Steve Graff

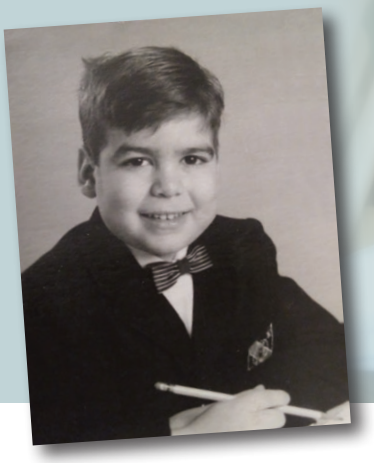
Photos by Peggy Peterson

For Mark Paviglianiti, it started in 1962 when he was just six years old. While he lay in bed sick for weeks with a fever, doctors from his hometown of Lancaster, Pa., worked to figure out what was wrong with him. Eventually, they spotted high levels of protein in his urine—a surefire sign of trouble in the kidneys.

They sent him to the Children's Hospital of Philadelphia, where the prominent pediatric kidney specialist Milton Rapoport, MD'31 put him on sulfa antibiotics to stabilize his kidney function, as well as prednisone. It worked. Three years later, he was off the medication and seemingly out of the woods, until his early 20s, when a kidney infection brought him back to a nephrologist. That infection, too, was fixed. Though Paviglianiti didn't feel like he had a chronic disease, these incidents were the start of a years-long journey. He and his doctors would end up keeping a watchful eye on his kidneys and higher-than-normal protein levels over the next 35 years, battling other issues, like a mild heart condition and high blood pressure and cholesterol, along the way.

Such is the life of a patient with chronic kidney disease (CKD).

Mark Paviglianiti, who first experienced symptoms of kidney disease at age 6, enrolled in the CRIC study in 2003. Every year, he provides samples of blood and urine and undergoes a variety of physical and mental tests to track the progression of his disease.



While it's rare for children to be diagnosed with the condition, the health problems Paviglianiti has faced are exceedingly common ones for adults with CKD. Patients' kidneys—the nonstop workhorses that rid the body of waste—progressively fail over time. Today, this complicated and highly variable disease, further complicated by its comorbidities, afflicts nearly one in seven people in America, 90 percent of whom have no idea they have it because symptoms, like constant fatigue and vomiting, typically don't appear until the last stage.

"Even as a young boy, my parents told me I had kidney disease, but nothing specific about it. Nor did they know how it happened," said Paviglianiti, now 62. "And to this day, I don't know what triggered it."

Paviglianiti's experience with CKD, in a way, mirrors one of the largest efforts to better understand it. As he progressed, so did a major epidemiological study that has been running for nearly two decades.

In what's known as the Chronic Renal Insufficiency Cohort (CRIC, pronounced crick) study, more than 100 researchers from the Perelman School of Medicine and other institutions have discovered new insights into the drivers of CKD and how it impacts the body's systems by closely following Paviglianiti and thousands of other patients. Almost 20 years ago, researchers couldn't have predicted the paths CRIC would take, nor what questions they'd get to ask or even the methods they'd use to answer them. And today, in what would have probably seemed like science fiction back then, researchers are turning to a cutting-edge discipline and its smart technologies to keep it growing.

BIRTH OF A STUDY

In the 1990s, before CRIC launched, many clinicians thought of kidney disease as "a binary thing, where it's like you jump off a building and nothing is happening until you hit the ground," said Harold I. Feldman, MD, MSCE, chair of Biostatistics, Epidemiology and Informatics in the Perelman School of Medicine, principal investigator of CRIC's Scientific and Data Coordinating Center and the study's national chair. "Like the rest of our community, I was awakened by the research that others were doing. I came to understand how important it was to think of CKD as a progressive erosion of health."

The binary mindset had left a whole terrain of health consequences unexplored.

In the clinic, most patients fell into two categories: normal kidney function or at risk for failure. If physicians spotted a problem, typically with the urine test showing too much protein, known as proteinuria, it was diagnosed as "pre-end-stage renal disease" or, worse, "chronic renal failure," a diag-

nosis that made it seem the kidneys had failed already. Clinicians would attempt to lower blood pressure and better manage patients' diabetes, two well-known drivers of CKD, but that's only if those problems existed. The cause of many cases was unknown. Eventually, sick patients on the edge of kidney failure—which wasn't uncommon—prepared for dialysis or, if they were lucky, received a transplant.

During this time, CKD rates in the United States had jumped significantly. From 1990 to 2001, the number of patients more than doubled, with about 19 million Americans suffering from CKD in 2001, the year that CRIC began, according to the Centers for Disease Control and Prevention. A small percentage of cases were diagnosed in children, as Paviglianiti's had been.

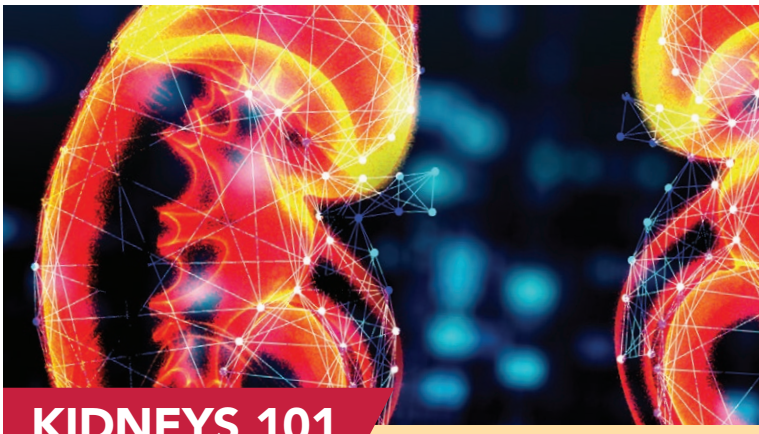
"Before CRIC, there was virtually no epidemiology data on the long-term consequences of kidney failure, nor was there much interest in understanding mechanisms by which kidney failure progresses, which could in turn lead to potential intervention," said Raymond Townsend, MD, the lead CRIC clinical center investigator at Penn, and professor of Medicine in the Division of Renal-Electrolyte and Hypertension, who has now enrolled more than 700 patients in the study. "All physicians knew at CRIC's start was that high blood pressure, the presence of diabetes, and protein excretion in the urine were risk indicators for CKD and its progression," he said.

It was only as recent as the late 1990s when "kidney disease" came to be recognized as "chronic kidney disease," a condition whose progressive nature was poorly understood.

In 1999, the National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK) convened a series of workshops on the issues, and Feldman attended. A decision was ultimately made at the behest Josephine Briggs, MD, then the director of NIDDK's Division of Kidney, Urologic, and Hematologic Diseases, to put out a request for grant applications and start a kidney disease counterpart to the Framingham Heart Study, which famously tracked cardiovascular health in thousands of volunteers from an old factory town outside Boston for decades, beginning in 1949. The study, which is still ongoing, is credited with saving millions of lives and introducing the words "risk factor" into the lexicon, in addition to implicating cigarette smoking and high cholesterol in heart disease, among other findings that emerged over time.

Penn was chosen to lead this new venture, along with six other clinical sites, with initial funding of $40 million for five years. Feldman would serve as principal investigator of the Scientific and Data Coordinating Center (see sidebar), along with J. Richard Landis, PhD, a professor of Biostatistics at Penn. CRIC's charge: to better understand traditional risk factors, like hypertension, and search for previously unknown factors for CKD progression and cardiovascular diseases, with an eye toward interventional trials to slow or stop it. Like the Framingham study, CRIC would recruit thousands of adult patients at different stages of CKD and follow them over time to find patterns: What was the relationship between cardiovascular diseases and CKD? What else may be driving progression? Were there any genetic mutations or biomarkers tied to CKD progression?

New questions—and answers—branched out from there, as meaningful associations and newer research techniques surfaced.



KIDNEYS 101

These two bean-shaped organs, roughly the size of a fist, work tirelessly to filter out the waste in the blood and excess water using a million tiny units called nephrons. About two gallons of blood pass through the kidneys about 20 times every day. Whatever the body doesn't need goes out with urine. The kidneys also control blood pressure and help keep bones healthy. The whole process is a fine-balancing act necessary for the body to function normally.

As CKD advances, it prevents the kidneys from excreting wastes, causing buildup in the bloodstream. Kidney dysfunction rarely reveals itself as it progresses, unless urine or blood is checked. It isn't until red flags, like nausea or vomiting, show up that a person or their physician realizes the kidneys are on the brink of failure.

CKD SNAPSHOT

Number of Americans....

Living with CKD:
30 million

With kidney failure:
662,000

Who die from kidney disease every year
50,000

On dialysis:
468,000

Living with a kidney transplant:
193,000

*Centers for Disease Control and Prevention

FIRST STEPS

In the study's first phase, CRIC researchers recruited a diverse group of 3,600 people from around the country, roughly 45 percent white, 46 percent black, and the rest Hispanic. Half of the patients had diabetes. Fifty-four percent were men.

Paviglianiti was among the first wave to enter into the study at Penn in 2003—the 43rd patient, to be precise. When he was in his late 30s, a routine check-up revealed high blood pressure and high levels of protein, so he took himself back to a Penn nephrologist, Robert Grossman, MD. A few years later, Grossman, then a CRIC investigator, suggested he join the study, given his overall good health and the state of his condition. CKD is categorized into five stages, and at the time Paviglianiti enrolled, he was stage 2.

During that first eight-hour study visit, the clinical research team took his blood pressure on all four limbs, along with his height, weight, and waist size. They performed an electrocardiogram, or EKG, to gauge his heart health. They took his medical history and did mental tests. They extracted blood. Asked him to pee in a cup. Clipped his finger and toe nails. This happened, give or take a few tests, every December, along with a phone call every six months.

"Any way you look at, I felt like it was a great opportunity to not only learn more about myself but also for the scientific community to learn more about the disease through me," Paviglianiti said. "Maybe the findings would help progress the science and help some other people down the road."

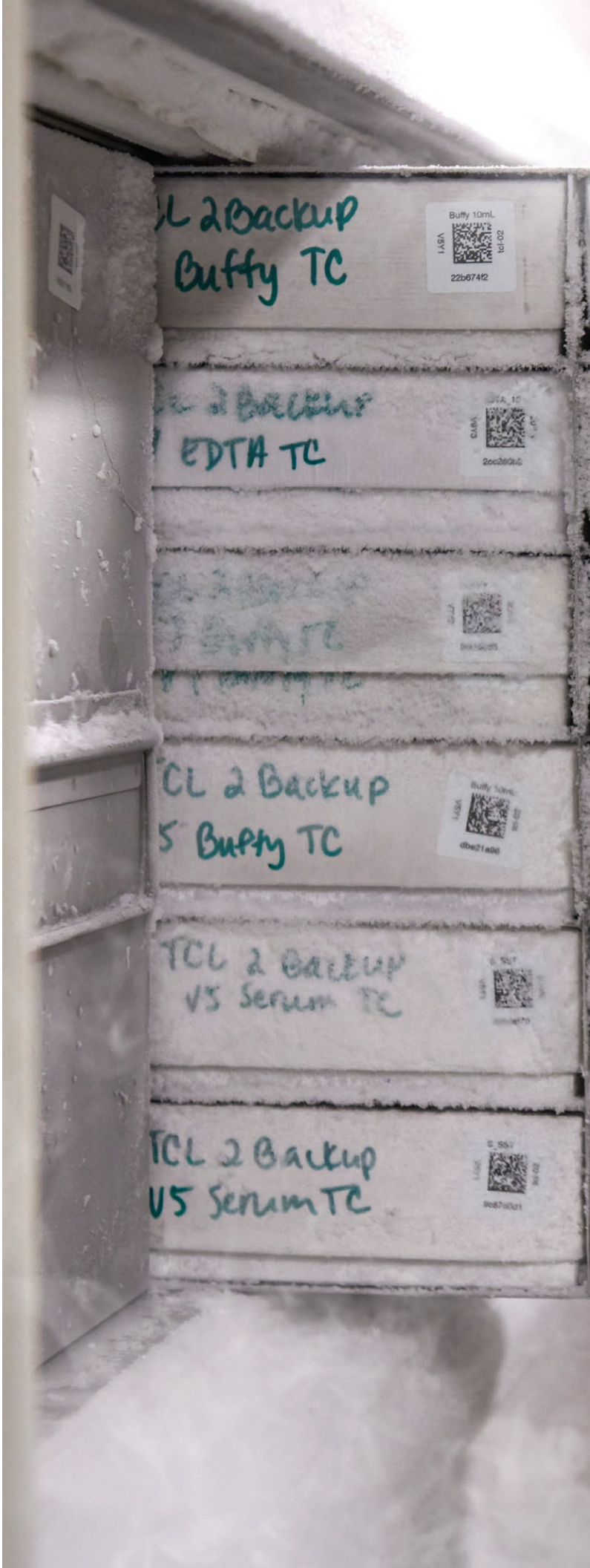
It wasn't long before analyses of these patients and their medical histories, using traditional statistical approaches, began revealing meaningful characteristics, or phenotypes. Meanwhile, just as CRIC began, the National Kidney Foundation published new guidelines to help physicians recognize and better define the stages of CKD, as well as other outcomes of interest beyond its progression.

On one front, CRIC confirmed what had been known: CKD disproportionately affected patients with a lower socioeconomic status and of color, and CKD patients were more likely to develop or die of CVD. But its prospective nature also helped see those events more clearly, even after only five or six years of follow-up data.

"Going into the study, the expectation was that the cardiovascular outcomes participants would most likely experience would be atherosclerotic ones, like myocardial infarctions and strokes," said Amanda Anderson, PhD, an associate professor of Epidemiology at Tulane University and long-time CRIC investigator, who formerly served on the faculty at Penn. "It was really striking to all of us when we started adjudicating all the hospitalizations and found that it was heart failure occurring at a much higher rate."

Knowing who is at high risk and for which diseases can help determine which patients may need preventive therapy.

Patients, regardless of their diabetic status, were also at a higher risk of peripheral arterial disease and stroke, CRIC researchers reported in studies in the *American Journal of Nephrology* and *American Journal of Kidney Diseases*.



The CRIC "freezer farm" at Penn Medicine contains over a million specimens of blood and urine, collected over a span of nearly 20 years. Each box and each vial is individually bar coded to track its location.

For Paviglianiti, the realities of CVD risks began to crystalize four years into the study. An EKG test from one of his clinical visits revealed a mild condition called Mobitz 1, where the heart regularly skips a beat, which led him to Frank E. Silvestry, MD'90, an associate professor of Medicine in the Division of Cardiovascular Medicine at Penn. Silvestry discovered that Paviglianiti had high cholesterol, too, a known risk factor for heart problems, so he put him on a statin, which stabilized his levels.

"I became more aware of the possible connection to heart-related illnesses and failure because of the CRIC study," said Paviglianiti, who was also on angiotensin-converting enzyme, or ACE, inhibitors, to control his high blood pressure. "And from that, I have maintained a patient relationship with Dr. Silvestry, to closely monitor my heart health and any potential disease progression."

Follow-up data from the cohort also told researchers that patients with a lower estimated glomerular filtration rate, or eGFR, were more likely to suffer CVD events, and that the eGFR could predict their risk of having one. The equation used to calculate eGFR, as opposed to just considering the levels of the waste product creatinine, is now commonly used in clinics to screen and stage patients, thanks in part to data from CRIC and other studies.

Longer-term data also offered up more precise information about blood pressure's effect on patients. CRIC Study researchers, reporting in the *Annals of Internal Medicine*, found that blood pressure above 130/80 was associated with progression of the disease, a lower figure than what was previously believed to drive it. This new target is appreciated more today in clinical settings, too.

"This is a space where observational outcomes, like from CRIC, in conjunction with other data, sometimes push practitioners across some treatment decision threshold," Feldman said.

ACE inhibitors helped get Paviglianiti's blood pressure down, which lowered his risk for future heart problems. Still, it wouldn't stop the progression of his CKD.

GROWTH SPURTS

During CRIC's initial phase, 300 more Hispanic participants were brought in through a supplementary grant, bringing the total to 3,900. CRIC was subsequently renewed in 2008 and 2013 for its next two phases during which another 1,850 participants would eventually be added, including more than 200 additional participants at Penn and 339 more Hispanic participants recruited in Chicago.

And so, as CRIC continued to grow, every December, year after year, Paviglianiti returned to Penn, providing samples of blood and urine during a three-hour visit. Thousands of others at sites across the country did the same. Clinical teams would pack up their samples daily, and ship them to Penn, where they were carefully checked in, barcoded, and filed away in racks within biobank "freezer

farms." Researchers stopped collection of finger and toe nails after the first phase of the study.

At the same time, Penn shipped thousands of samples to NIDDK's National Repository for researchers working on the parent study, as well as ancillary studies, to access. These side studies, led by CRIC and non-CRIC investigators, were funded by both the NIH and other sources.

"I think it is fair to say that the CRIC study is the best-funded study, with respect to ancillary studies, at the NIDDK by far, and that is a tribute to Harv [Feldman], the principal investigators, and many other people who were not involved as investigators but came on board through our outreach," said John Kusek, PhD, a former NIDDK project scientist for CRIC who retired in 2017. "That's a very unique and robust success story for the CRIC team."

The wide array of ancillary studies conducted across the country are among CRIC's biggest strengths, adding tens of millions of dollars to the parent project, which has received roughly $8 million a year from the NIH. The ancillary studies are where CRIC really expanded its footprint and contributions to the field.

Work led by a Johns Hopkins University researcher showed that older patients were on a cognitive decline as their CKD progressed or went on dialysis. Another study out of Penn published in the *American Journal of Nephrology* found that CKD patients were more likely to have poor physical performance and became frailer as their disease progressed. In another series of studies, Juan E. Grunwald, MD, a professor of Ophthalmology at Penn, using non-invasive, photographic tests, found that patients with damage to the retinal vasculature, known as retinopathy, had a greater chance of developing end-stage renal disease and CVD.

Cognitive decline, frailty, and retinopathy—each of these co-morbidities not only highlights the burden of disease patients face, but each also can also be used to gauge the severity of CKD in patients, if clinicians know to screen for them early on. The outcomes, for the most part, were unrecognized by the nephrology community before.

Another approach came from Townsend early on in CRIC. Townsend believed stiffness in large arteries was involved in the connections between high blood pressure and diabetes and some cases of CKD and related CVD. He began gathering preliminary data on arterial stiffness by measuring with technology called pulse wave velocity; that eventually led to a 10-year NIH grant. The data, ultimately published in 2018 articles in the *American Journal of Kidney Diseases* and in *Hypertension*, showed he was right. He found that stiffness in the large artery is a potent predictor of kidney disease progression, death, and cardiovascular complications. However, the work never made it past that initial phase nor into any interventional trials, much to Townsend's chagrin. "Meanwhile, the Europeans remain ahead of us in that area," he said. "And Asian countries incorporate arterial stiffness into clinical practice. The rest of the world has gotten on board; we're just a little behind here in the states."

NEXT SEQUENCE

At the end of CRIC's second phase and throughout its third phase, now with 10 years' worth of data, investigators began in earnest to utilize more of the stored specimens. That's blood and urine, and other samples provided by thousands of participants like Paviglianiti, year after year, for over a decade. These precious commodities were plucked out, analyzed, measured, and scanned dozens of times by industrious researchers, many at Penn, looking for markers that may be driving the disease.

And as CRIC has grown up alongside the advent and broadening accessibility of new genetic approaches in the last two decades, researchers have found genes of interest in CKD with an evolving set of methods—from basic genotyping, like family-pedigree studies; to DNA microarray and genome-wide association studies, or GWAS; to epigenetic approaches.

In 2011, what CRIC researchers hail as one of the larger clinical contributions from the study was published in *JAMA*. From a mineral metabolic marker in plasma, researchers identified a risk factor for end-stage renal disease in patients with relatively preserved kidney function, and for death in patients at all stages of CKD—it's called FGF-23, or phosphate-regulating hormone fibroblast growth factor 23. But, as with the discovery of arterial stiffness as a risk factor, this finding has not yet moved forward to potential interventions for CKD. Antibody drugs that target FGF-23 exist, and there are ongoing trials in other diseases pursuing the hypothesis that intervening on this marker will ultimately lead to clinical benefit. Thus far, nothing has been put into motion to study it in CKD patients.

A seminal CRIC study published in the *New England Journal of Medicine* in 2013 found gene variants called *APOL1* that could help explain the striking racial disparity in CKD progression. More recent epigenetic studies include an ongoing project led by Katalin Susztak, MD, PhD, a professor of Medicine in the Division of Renal-Electrolyte and Hypertension at Penn. Preliminary data from a study that incorporated both genetic and epigenetic analyses identified novel genes that may be drivers of CKD in diabetics.

The vast span of genetic and epigenetic discovery underscores another strength of CRIC: It's the repositories at both the NIDDK and Penn—which now have over one million samples split between labs in the Smilow Center for Translational Research and Penn Presbyterian—that make these and future analyses even possible.

"I think CRIC is best characterized as a research platform," said Anderson, who has co-authored several biomarker papers. "At the beginning of the study when it was being planned and conceptualized, we had no idea that FGF-23 was something that we even wanted to measure. No one knew about *APOL1*. So just building the capacity for these investigations with the longitudinal follow-up is just an incredible asset of the study. It is really the hallmark of the study that we have stored specimens and the ability to go back to test novel markers."

NEW AGE

When the clinical research team approached Paviglianiti about remaining enrolled as one of the 3,000 patients who CRIC continues to follow for its new, fourth phase, he said yes without hesitation, just like he did every single phase before it.

The new phase was funded by a recent award of $40 million by NIDDK, including $17 million to Penn, extending it another five years; it will have been running for 22 years when this phase ends.

"I'm hoping they see the trends, so they can piece all this together and even be able to figure out where the trajectory of this goes," said Paviglianiti, whose disease advanced to stage 4 briefly last year, but is back at stage 3 and being successfully managed today. His initial enrollment in 2003, and his continued enrollment in the newest phase, means he expects to be a CRIC participant for at least 20 years, nearly a third of his life—and longer might be possible if it is renewed yet again.

For this next phase, CRIC investigators will need more frequent data on top of the data they're already capturing. To do that, its data collection will go mobile. Patients like Paviglianiti will be equipped with small persistent-monitoring devices that strap onto the chest. The device measures physical activity and physiological parameters and generates heart beat data—which can tell researchers over time who may be at highest risk of cardiovascular and other complications.

A second device will allow patients to regularly use finger-stick blood samples to measure their own creatinine so the team can track kidney function over time. That will be in conjunction with monitoring other stressors, like illnesses, medications, or physical activity, for example, that researchers suspect play a cumulative role in kidney function decline. The biggest advantage is the amount of data. Blood and urine collection will go from once—those annual visits Paviglianiti has made each December, for the last 16

A UNIQUE MODEL OF COORDINATION

Much of CRIC's success is attributed to the model by which it is centrally coordinated at Penn—one center managing both the data from different clinical sites, and the direction of clinical investigation. Today, a number of other studies in the United States and around the world are set up this way, including ones in Germany, Japan, China, and India.

On the surface, this may not sound unique or noteworthy. All multi-site research studies have a data coordinating center to manage, verify, store, and analyze data coming in from different clinical sites. But when CRIC kicked off in 2001, its center was unlike anything that had come before it. "We are called the Scientific and Data Coordinating Center," said J. Richard Landis, PhD, a professor of Biostatistics at Penn, and co-principal investigator for the center. "That's important because it means that the group at Penn is coordinating the data and the science."

CRIC placed the lead statistician, Landis, and clinical expert, Feldman, at one hub. Since the project's inception, the co-principal investigators have led a vast array of biostatisticians, epidemiologists, clinical research team members, project and data managers, and software and web site developers.

The SDCC group is really the gatekeeper of CRIC that moves it from one phase to the next. They drive the pursuit of scientific questions, design studies and clinical protocols, plan out statistical approaches, train investigators, and analyze and interpret the data. It's a multifaceted, herculean task in the scientific process, especially for a study like CRIC, with over 5,500 patients, 100 investigators spread across the country, and massive amounts of data.

CRIC SNAPSHOT

Total Funding:
$160 million
from NIH

plus more than
$50 million
from ancillary studies

Ancillary Studies:
100 plus

Clinical Sites:
12

Investigators:
Over 100

Peer-Reviewed Journal Publications:
Over 180

Specimens in Penn's "Freezer Farm":
Over 1 million

years and counting—to at-home collection over 20 times a year. All of these data will then be downloaded and fed to the team.

"Integrating the data is a large challenge, but it is also an opportunity for what I will call global discovery," Landis said. "We are going to have more frequent and complex detailed measures to add in to what we have done so far… Having it all in the same study allows us to pursue questions we couldn't before."

Despite advances in understanding the progression of CKD and several promising discoveries that pointed to interventions, no new therapies to halt the disease have surfaced. The reality is, there is a lot that researchers still need to learn about this highly variable disease. Another hurdle is a lack of funding. Compared to other diseases, overall, CKD research dollars rank fairly low, despite taking more lives than breast or prostate cancer.

To move forward, the CRIC study is using its burgeoning set of data and bringing a new discipline—biomedical informatics—and some of its most sophisticated "big data" approaches into the fold. Many of the same questions about the progression of CKD and CVD apply, but how they're tackling them will look different. Artificial intelligence and machine learning tools will soon be used to see patterns in a sea of new and old data that traditional approaches can't identify alone.

"I think the reason why informatics is an important part of this is because, while traditional statistical analyses are very important, and still maintain pride of place here, new machine learning methods can help inform those analyses and lead people to certain directions that they might not have thought of," said John H. Holmes, PhD, of Penn's Institute of Biomedical Informatics (IBI), who is leading the informatics piece of CRIC's latest phase.

As an example of these machine learning methods, imagine a 3D image on a screen. There are several thousand dots clustered together according to different colors and intensities. Some of those clusters are connected by various lines, each, too, with their own different colors and intensities. That visual may sound a bit chaotic, but to informaticians like Holmes, it's a byproduct of a sophisticated method sorting terabytes to tell a story—or many stories. Approaches like this, called a topological analysis, can reveal commonalities among and between patients by using algorithms that enable researchers to recognize a vast number of data points and then learn what to do with them as they come in.

CRIC researchers will use the tools, for the first time, to not only find unseen traits, but also predict future health states of patients.

"We'll essentially be mapping the progression of a disease over time—and that mapping has a certain architecture to it, a certain design," Holmes said. "We can actually get a good sense of, 'Oh, this person over here is probably going to deteriorate faster than this person over here. Let's see why.' And the reason why might be in the link between the two people."

One cluster, for example, could represent CKD patients of a certain age or stage, with a bright line connecting to other clusters of patients with heart failure or, say, on a certain drug during a period of time. Those connections may represent telling relationships or patterns about subgroups and risks, and why certain patients are progressing.

"We now have the ability to leverage this [persistent] monitoring, where we literally paste a device onto someone's chest for multiple days, and it generates terabytes of information," Feldman said. "And then to use informatics to extract from those data meaningful patterns that we can analyze statistically. That is something that we just didn't even know about back in 2000, when the study was first designed."

In its latest phase, CRIC will equip participants with small persistent-monitoring devices to provide a greater level of detail in cardiovascular data.

They didn't know all of the methods—nor all of the questions that the CRIC core teams, and ancillary study teams across the country would come to ask. But day after day, week after week, samples still arrive at the Smilow Center. They are scanned, barcoded, and carefully stored, alongside a million plus samples that arrived before them. And so CRIC continues to grow and await new methods and new questions yet to be imagined.

Read this story online with related links at PennMedicine.org/magazine/CRIC

PENN MEDICINE IN FLORIDA: IT'S ALWAYS SUNNY…

Alumni and friends in Florida were treated to an insider's view of Penn Medicine and its *Power of Penn Medicine* campaign with a series of events in Naples and Palm Beach this winter.

Penn Medicine first visited Palm Beach fourteen years ago, and its programming has been growing ever since. In addition to two exclusive salon dinners hosted by Dean Larry Jameson, Penn Medicine leadership and faculty could be seen in multiple private receptions, a local grand rounds, and even a Sunday polo match.

"Penn Medicine has been enjoying a growing presence in Naples over the past three years thanks to this wonderful community of friends," Jameson observed. It was Donna and Rob Corrato who brought Penn Medicine to The Port Royal Club for a campaign dinner and panel discussion, and Jack Hoopes invited faculty to share the latest innovations with members of the YPO. Jacqueline and Arturo Balandra and Robert Klausner made Penn Medicine faculty feel right at home with special luncheons.

Over on the other side of the state, Hilarie and Mitch Morgan and Gail and Jim Riepe graciously opened the doors of their lovely homes to Penn Medicine's leadership, faculty, and friends. And guests at the *Power of Penn Medicine* salon dinner were treated by a surprise appearance by a special guest: alumnus and Nobel laureate Michael Brown, MD'66, who was proud to support his medical alma mater.

Above: At the *Power of Penn Medicine* panel discussion in Naples, attendees got to hear from Penn Medicine faculty leaders, as well as a Perelman School of Medicine student.

Below: James and **Judy Oliver**, alongside **Helene Case**, took in the Naples sunset at the Port Royal Club prior to the start of the panel.

Right: Julian Johnson Professor of Cardiovascular Surgery **Michael A. Acker, MD** and heart transplant recipient and Penn Medicine Princeton Health Board of Trustees Chair **Kim Pimley** spoke at the Palm Beach *Power of Penn Medicine* panel about new advances in cardiovascular surgery—and their impact on patients.

Left: Jack Hoopes and **Maggy Myers**, **MD**, seen here at our Naples dinner panel in the Port Royal Club, also joined our faculty and members of the YPO for a luncheon hosted by Hoopes, where the latest advances in research and clinical care at Penn Medicine were discussed.

Above: Donna and **Robert Corrato** hosted the *Power of Penn Medicine* campaign dinner at the Port Royal Club.

Left: Chair of Neurology **Frances Jensen, MD, FACP**, speaks with **Jacqueline** and **Arturo Balandra**, who hosted a cocktail hour prior to the dinner.

CELEBRATING THE MEMORY OF A GREAT PHILADELPHIA AND PENN CITIZEN

In January 2019, Penn Medicine—and the City of Philadelphia—lost one of its most significant and committed civic partners with the passing of Raymond G. Perelman, W'40, Hon'14. He was the patriarch of a true "Penn family": Ray was a Wharton School alumnus and his children and grandchildren, including son and Penn trustee Ronald O. Perelman, are Penn graduates. In his later years, Ray could be seen on campus or at medical school events like graduation and the celebration of the Perelman School of Medicine's 250th year. He particularly enjoyed meeting Penn's incoming medical students.

One of Philadelphia's native sons, Ray felt strongly about giving back to the community that had given him so much. He was the son of a Lithuanian immigrant who passed on to his son the vision and tenacity that would become Ray's hallmark, expanding his father's business and growing it into an enormously successful concern with manufacturing, mining, and financial interests. Always aware of his responsibility to society, he was active with a large number of organizations, including the Allied Jewish Appeal, the United Way, the American Technion Society, Temple University Hospital, the National Museum of American Jewish History, the Albert Einstein Health Center, and the Beth Sholom Congregation.

With his beloved wife, the late Ruth Caplan Perelman, Ray made a historic $225 million gift creating a permanent endowment for the School of Medicine, which was renamed the Raymond and Ruth Perelman School of Medicine at the University of Pennsylvania. The state-of-the-art Ruth and Raymond Perelman Center for Advanced Medicine, created thanks to the couple's $25 million gift, opened in 2008.

Beyond Penn's campus, Ray's legendary generosity has greatly impacted Philadelphia's educational and cultural landscape. His support was key for the landmark Kimmel Center for the Performing Arts and its intimate Perelman Theater to the magnificent Perelman Building at the Philadelphia Museum of Art, and both Children's Hospital of Philadelphia and Drexel University celebrate Ray on their campuses. Jewish causes were also close to Ray's heart. He named the Raymond and Ruth Perelman Jewish Day School in Wynnewood, the Raymond G. Perelman Center for Jewish Life at Drexel University, and supported many other Jewish cultural and welfare organizations.

Above: In October of 2012, **Raymond Perelman** joined Dean **Larry Jameson** and University of Pennsylvania President **Amy Gutmann** at the Perelman Center for Advanced Medicine for the unveiling of a portrait of Raymond and his late wife Ruth by renowned artist Nelson Shanks.

Right: Raymond and Ruth cut the ribbon at the opening celebration of the Perelman Center for Advanced Medicine, joined by Gutmann, University of Pennsylvania Health System CEO **Ralph Muller**, and then-Dean **Arthur H. Rubenstein**.

If you would like to make a gift to honor the memory of Ray Perelman, please visit www.pennmedicine.org/perelmanendowment to make a contribution to the Raymond and Ruth Perelman Endowment fund.

You can also make a donation to the fund by sending a check to:

Raymond and Ruth Perelman Endowment Fund
c/o Penn Medicine Development and Alumni Relations
3535 Market Street, Suite 750
Philadelphia, PA 19104

Checks should be made out to the "Trustees of the University of Pennsylvania."

David A. Asch, MD, MBA'89, GME'87, executive director of the Center for Health Care Innovation, the John Morgan Professor of Medicine and Medical Ethics & Health Policy, and a professor of Health Care Management and Operations, Information and Decisions at the Wharton School, was awarded the Distinguished Investigator Award for Translation into Public Benefit and Policy by the Association for Clinical and Translational Science. This award recognizes a senior researcher who has successfully applied translational research findings into effective public policies that promote health or implementation and dissemination of translational solutions.

Justin E. Bekelman, MD, chief of Genitourinary Oncology Service, an associate professor of Radiation Oncology and Medical Ethics & Health Policy, and a senior fellow in the Leonard Davis Institute for Health Economics, was named the winner of the American Cancer Society's Cancer Control Award. This annual award recognizes major and unique contributions to cancer control. The Philadelphia Market of the American Cancer Society described Bekelman as "one of the most consequential cancer health services researchers in the United States who has achieved international distinction for his path-breaking scientific leadership in cancer comparative effectiveness and delivery system reform research."

Jean Bennett, MD, PhD, the F.M. Kirby Professor of Ophthalmology, received the Sanford Foundation Lorraine Cross

Award. The award honors someone who has pioneered a medical breakthrough, innovation, or treatment to transform global health, such as Bennett's work to cure an inherited form of blindness. The Sanford Foundation notes, "It starts with a $1 million prize, and it continues with a life-changing impact for us all."

Dan Constantino, chief Information Security officer, **Gary Davidson**, senior vice president and chief information officer of Lancaster General Health, **Seth Fogie**, director of Information Security, **Dwight Hobbs**, senior security engineer, and **Andrea Thomas-Lloyd**, MBA, CISSP, CHPS, director of Information Assurance, were honored at the IDG Communications, Inc., CSO50 Awards for their "Just in Time Awareness Project." The awards recognize organizations that are raising the bar for innovation in security projects and initiatives.

Barry Fuchs, MD, a professor of Pulmonary, Allergy, and Critical Care Medicine and medical director of the Medical Intensive Care Unit, Intermediate Medical Care Unit, and Respiratory Care Service, was awarded a Digital Edge 50 Award by IDG Communications, Inc. in recognition of his team's work on the Awakening Breathing Coordination Program. The award highlights an organization at the forefront of digital transformation and innovation.

Gregory G. Ginsberg, MD, director of Endoscopic Services and a professor of Surgery and Medicine, was granted the Rudolf V. Schindler Award. The highest honor of the American Society for Gastrointestinal Endoscopy, this award is granted to a member whose accomplishments in endoscopic research, education, and service exemplify the standards and traditions of the award's namesake.

Frederick S. Kaplan, MD, chief of Molecular Orthopaedic Medicine and the Isaac and Rose Nassau Professor of Orthopaedic Molecular Medicine in Orthopaedic Surgery, earned the Grand Hamdan International Award on Musculoskeletal Disorders. This honor recognizes dedication to the alleviation of the suffering through exemplary research and service. Kaplan's work investigating the rare diseases fibrodysplasia ossificans progressiva and progressive osseous heteroplasia were described as having "challenged existing dogma far outside the usual realm of musculoskeletal medicine."

Maureen G. Maguire, PhD, the Carolyn F. Jones Professor of Ophthalmology, received the Macula Society Lawrence J. Singerman Medal. This annual award is given to one outstanding society member for their contributions to the advancement of science through retinal clinical trials. Maguire was recognized for her work as the principal investigator of the coordinating center for several multi-site clinical trials for the prevention and treatment of age-related macular degeneration.

Virgina Man-Yee Lee, PhD, MBA'84, the John H. Ware 3rd Endowed Professor in Alzheimer's Research, director of the Center for Neurodegenerative Disease Research, and co-director of the Marian S. Ware Center for Alzheimer's Drug Discovery Program, won the Robert A. Pritzker Prize for Leadership in Parkinson's Research. Conferred by the Michael J. Fox Foundation for Parkinson's Research, the prize honors researchers who make exceptional contributions to Parkinson's research and demonstrate a commitment to mentoring the next generation of Parkinson's scientists. Lee is the first woman to be selected for the Pritzker Prize.

Kiran Musunuru, MD, PhD, MPH, an associate professor of Cardiovascular Medicine and Genetics, won the Outstanding Investigator Award from the American Federation for Medical Research. This award is presented annually to an AFMR member who has demonstrated intellectual and scientific independence and whose investigative biomedical research has provided innovative insight and had significant impact on a major scientific or clinical problem. Musunuru was also awarded the American Philosophical Society's Judson Daland Prize for Outstanding Achievement in Clinical Investigation in recognition of his work discovering and therapeutically targeting cardiovascular disease genes.

Maria A. Oquendo, MD, PhD, chair of Psychiatry and the Ruth Meltzer Professor of Psychiatry, was honored by the American College of Neuropsychopharmacology with the Delores Shockley Minority Mentoring Award. The award recognizes a member of the ACNP whose passion and success in mentoring young scientists from underrepresented groups in the field have fostered a diverse medical and academic workforce.

Christoph Thaiss, PhD, an assistant professor of Microbiology, earned the Science & SciLife Lab Grand Prize for Young Scientists. This global prize rewards outstanding scientists at an early stage of their careers in translational medicine, genomics and proteomics, ecology and environment, or cell and molecular biology. The Grand Prize winner receives $30,000 and is published in *Science Magazine*.

Send your progress notes and photos to:
Donor Relations
Penn Medicine Development and Alumni Relations
3535 Market Street, Suite 750
Philadelphia, PA 19104-3309
medalum@dev.upenn.edu

1970s

Robert J. Spiegel, MD'75 has been appointed to the board of directors of Cyclacel Pharmaceuticals, Inc., a biopharmaceutical company developing innovative medicines based on cancer biology. He currently serves on the board of directors of Geron Corporation and Edge Therapeutics, Inc. He is the chairman of Vidac Pharma and former executive chairman of NexImmune, Inc., the president of Spiegel Consulting LLC, and an assistant professor of Medicine at Weill Cornell Medical College. He is also a senior advisor to the private equity firm Warburg Pincus and an advisor to the Israel Biotech Fund.

Robert E. Wenger, MD, BA'67, GME'75 has been named the head of mental health services at Life of Purpose Addiction Treatment Centers. In his distinguished professional career, he has pioneered and excelled in treating clients and their families suffering from mental health and behavioral health disorders, while in private practice as well as working with renowned addiction treatment centers, several located in the greater Philadelphia area.

James ("Terry") J. Ferguson, FACC, FAHA, MD'79 has been named the chief medical officer of Matinas BioPharma Holdings, Inc., a clinical-stage biopharmaceutical company. He is a well-recognized, industry leading academic and clinical expert with over 25 years of experience in cardiovascular medicine.

Kevin H. Mosser, BA'75, MD'79 has been named senior medical consultant at the Lancaster-based law firm Saxton & Stump. Previously, he was the president and CEO of Wellspan Health, which consists of eight hospitals, 19,000 employees, and more than 170 patient-care sites.

1980s

James Beck, MD'84, GME'87, **Lynn M. Schnapp**, MD'86, GME'89, and **Marc Moss**, MD'87, GME'90 are currently in the executive committee at the American Thoracic Society, the world's leading medical association dedicated to advancing pulmonary, critical care, and sleep medicine. Beck is the ATS president-elect and chief of medicine for the VA Eastern Colorado Health Care System, and professor and vice-chair for Veterans Affairs in the University of Colorado's Department of Medicine. Schnapp is the ATS secretary-treasurer (ATS president 2021-22) and professor and division chief, Division of Pulmonary, Critical Care, Allergy and Sleep Medicine at the Medical University of South Carolina, Charleston. Moss is the ATS immediate past president, and professor, interim chief, Division of Pulmonary Sciences and Critical Care Medicine and vice chair for Clinical Research at the University of Colorado Department of Medicine.

Alan T. Wright, MD'82 has joined the board of directors of the Society for Women's Health Research, a national medical and policy research nonprofit. He is currently the chief medical officer at Roche Diagnostics Corp., where he serves as a clinical spokesperson and medical advisor. Until 2005, he was the chairman and CEO of Star Pharmaceuticals, a firm he founded to serve the needs of urological patients.

Gene Z. Salkind, MD, BA'74, GME'85 has joined the board of directors of Mobiquity Technologies, a developer of mobile-based software-as-a-service platforms for advertising and data storage. He is a neurosurgeon and co-founder of his own practice, Bruno and Salkind, MD. He is currently the chief of Neurosurgery at Holy Redeemer Hospital.

Helen Mary Kane Kuroki, MD'88, GME'91 has been named the chief medical officer at Women's Care Florida, a network of experts in several women's health specialties operating in sixty locations across central Florida. She comes to Women's Care Florida from the Catholic Health Initiatives Memorial Healthcare System in Chattanooga, Tennessee where she served as chief medical officer.

1990s

Adam C. Husney, MD'90 has been named chief executive officer of Healthwise, a leader in evidence-based health education, technology, and services. He was named chief medical officer in 2016 and will continue to serve in that role. A board-certified family medicine physician, he completed his residency training at the University of Michigan He practiced at the Hitchcock Clinic in Concord, N.H., before moving to Idaho to work as an urgent-care physician. He joined Healthwise in 2000 as an associate medical director and later served as medical director.

Marc Jackson, MD, GME'91 has been appointed vice president of education at the American College of Obstetricians and Gynecologists (ACOG). A graduate of the University of Texas Southwestern Medical School, he completed his residency at the University of Texas in San Antonio and his maternal-fetal medicine fellowship at the University of Pennsylvania.

David Lawrence Nathan, MD'94 has been appointed chief medical advisor at 4Front Holdings, LLC, a leading retail and brand development company in the U.S. cannabis sector. He will serve as a liaison to the advisory board for Mission, 4Front's branded network of medical marijuana dispensaries, to ensure professional medical expertise remains central to 4Front's overall operations.

Michael J. Detke, MA'89, MD'96, PhD'98 has been added to the senior leadership team of Cortexyme Pharmaceuticals, a clinical-stage developer of therapeutics designed to alter the course of Alzheimer's disease and other degenerative disorders. He will serve as chief medical officer and will oversee both clinical development and regulatory affairs. He has extensive experience in drug development, having recently served as chief medical officer of Embera NeuroTherapeutics and as a senior medical director for the late-stage development of Cymbalta and Prozac.

Natalie R. Sacks, MD'96, GME'02 has been appointed chief medical officer at Harpoon Therapeutics, Inc., a clinical-stage immunotherapy company developing a new class of T cell engaging therapeutics, and to the board of directors of Caribou Biosciences, Inc., a genome editing company. She most recently served as chief medical officer of Aduro Biotech, a company focused on the advancement of novel immuno-oncology technologies. She was an assistant clinical professor at the University of California, San Francisco, and served as volunteer attending physician in Hematology-Oncology at San Francisco General Hospital for more than a decade.

Tabassum Salam, MD'97 has been named the vice president for medical education at the American College of Physicians. She will be responsible for designing and implementing clinical education initiatives, representing ACP through external collaborations with medical education organizations, and advancing ACP's medical education services through business and program management. Board certified in internal medicine, she joins ACP from Christiana Care Health System in Delaware, where she practiced general internal medicine and was medical director of Population Health, Utilization Management and Patient and Family Health Education. She is a current MBA candidate at Wharton ('20).

Tara D. Butler, BS'87, MBA'91, MD'98 has joined the board of directors at Renovia Inc., a company dedicated to discovering and delivering first-line digital therapeutic and diagnostic devices for women with pelvic floor disorders. She is a managing director at Ascension Ventures, which recently acted as a lead investor in Renovia's Series B financing. She has been a board member or observer at various Ascension Ventures portfolio companies, including Apama Medical, Augmenix, Cardionomic, CHF Solutions, Confluent Surgical, CSA Medical, EBR Systems, EKOS Corporation, HemoSphere, Imperative Care, Instylla, Ivantis, MindFrame, Neurolutions, Ocular Therapeutix, Stereotaxis, and TomoTherapy.

2000s

Lara S. Sullivan, MD'01 has been appointed to the board of directors of Rexahn Pharmaceuticals, a clinical stage biopharmaceutical company dedicated to developing targeted therapeutics for the treatment of cancer. She has also been appointed to serve as chair of the newly formed Business Development Committee of the board. She is a founder and previous president of SpringWorks Therapeutics, a clinical-stage biopharmaceutical firm. She previously served as a vice president of Pfizer from 2011 until 2017.

Jay R. Vankatesan, MD'02, PhD'02 has been appointed president and chief executive officer at Angion Biomedica Corp., a late-stage clinical biopharmaceutical company focused on kidney diseases and other acute organ injuries. He is also a managing partner at Alpine BioVentures, a biotechnology venture capital fund. Prior to Angion, he served as president of Alpine Immune Sciences and where he remains on its board of directors.

Tapan Nitin Maniar, MD'03, GME'10, GR'11 has been appointed vice president of clinical development at Torque, an immuno-oncology company developing Deep Primed™ T Cell Therapeutics to direct immune power deep within the tumor microenvironment. He was senior director of clinical development at Atara Biotherapeutics, where he led clinical development of several allogeneic T cell therapy programs for oncology and autoimmune diseases.

Anand Prabhakar, MD'04, MBA'16 has been named the chair of Radiology at the Newton-Wellesley Hospital in Wellesley, Mass. He was previously a staff radiologist at the Massachusetts General Hospital in the Division of Emergency Radiology. He is also an assistant professor of Radiology at Harvard Medical School. Before this experience, he was the associate medical director of radiology at Nantucket Cottage Hospital and associate director of the Center for Research in the Emergency Department Operations at the Massachusetts General Hospital.

Samuel Hahn, MD'09 has opened the Maryland Center for Facial Plastic Surgery in Hunt Valley, Md. Led by him, the surgical facility will specialize in facial plastic surgery and medical spa treatments for both cosmetic and reconstructive purposes. He is a member of the American Academy of Facial Plastic and Reconstructive Surgery and is an author of several peer reviewed studies on facial surgery.

2010s

Kathrin Bourdeu, MD, PhD, GME'10 has been named chief of anesthesia at Massachusetts Eye and Ear. She earned her medical degree and a PhD in neuro-anat-

omy from the University of Cologne in Germany. Her clinical training includes internships in France, Canada and the U.S. and residency training in anesthesia at the University of Pennsylvania. At the University of Pennsylvania, she received a Resident of the Year Award and subsequently served on the medical staff for two years, specializing in thoracic anesthesia. She is currently an instructor in anesthesia at Harvard Medical School.

Janet Haas, MD, GME'10 has joined the National Audubon Society Board of Directors. In addition to her work with the foundation, she practices palliative medicine at the Abramson Cancer Center of Pennsylvania Hospital. She also serves as Trustee of the University of Pennsylvania, Morris Arboretum and the Free Library of Philadelphia, and is on the board of advisors for Audubon's newest nature center in Philadelphia, the Discovery Center.

OBITUARIES

1940s

Mark J. Ciccantelli, MD'45, a physician; Jan. 1. He served the Milwaukee area as a physician for over four decades. He served in the US Army Medical Corps and was discharged as a captain in 1948. He started his medical career as a general practitioner in East Troy, Wisc. He did a residency in internal medicine at Milwaukee VA Medical Center, and in 1957, joined the Clinic of Internal Medicine in Wauwatosa. He was affiliated during his career with a number of area hospitals, including St. Luke's, West Allis Memorial and St. Mary's, where he was Director of Medical Education from 1959 to 1972 and spent one year as chief of Medicine at the VA Butler (Pa.) Healthcare. In 1976, he became director of the family practice residency program at Deaconess & Good Samaritan Hospitals. He returned to private practice in the 1980s and finished his career with the Clinic of Internal Medicine.

Arthur M. Coddington, MD'46, a pediatrician; Dec. 29. He graduated from Princeton University in 1943 majoring in biology in preparation for medical school. After medical school, he completed an internship at Robert Packer Hospital. He then served as a U.S. Army Captain during peacetime in Japan and Korea as a medic. Afterwards, he

completed two residencies, one in pathology at Robert Packer and another in pediatrics at the Children's Hospital in Pittsburgh. In 1952, he established a private practice in pediatrics in Johnson City. He opened Tier Acne Clinics in 1990. At various points in time, he was physician for Johnson City and Binghamton school districts, worked overnights in the ER at Wilson UHS, and part-time at the Binghamton University Health Services Center.

Milton M. Yarmy, MD, GME'46, a physician; Dec. 11. He received his undergraduate degree from the University of Michigan. He obtained his medical degree from Wayne State School of Medicine in Detroit. He completed his graduate work in Internal Medicine at the University of Pennsylvania School of Medicine. He was certified in Internal Medicine by the American Board of Internal Medicine. He was on the staff of Northside Hospital and served on its board for many years. He was a member of the Mahoning County Medical Society, the American Medical Association, and a life member of the American College of Physicians.

Wiley Kemp Livingston, Sr., MD'47, GME'51, an ophthalmologist; Feb. 13. He attended Birmingham-Southern College and the University of Michigan, where he received his A.B. degree. He attended the University of Alabama Medical School in Tuscaloosa for basic medical sciences and received his MD degree from the University of Pennsylvania School of Medicine where he was a member of Nu Sigma Nu medical fraternity. He interned at the Hospital of the University of Pennsylvania and served his ophthalmology residency at the Wilmer Eye Institute at John Hopkins Hospital. He was certified by the American Board of Ophthalmology and elected a fellow in the American Academy of Ophthalmology, and later a life member and a fellow in the American College of Surgeons. During the Korean conflict he served as chief (captain), Eye Section, U.S. Army Hospital, Fort Campbell, Ky. Following this, he returned to Birmingham where he practiced ophthalmology until his retirement in 1987.

Burton Tabakin, BA'43, MD'47, GME'49, a retired professor of Medicine in cardiology; Sept. 2. Following completion of his residency training in internal medicine and fellowship in Physiology at the University of Vermont in 1952, he spent two years as a medical officer in the US Air Force Hospital Thoracic Center in San Antonio, Texas. In 1954 he returned to Vermont where he became a member of the Mary Fletcher Hospital staff. Apart from two sabbaticals—he spent his entire career at UVM-Mary Fletcher-MCHV-Fletcher Allen Health Center.

Marian Bosien, MD'48, an anesthesiologist; Oct. 11. She graduated from Lebanon Valley College in 1944. After her internship at St Luke's Hospital in Cleveland, she completed her residency in anesthesiology at Mary Hitchcock Memorial Hospital in Lebanon, N.H. She served on faculty of Dartmouth Medical School. In 1954, she moved to Tryon, N.C. where she began her medical practice and established Tryon Medical Associates to meet the health care needs of Polk County. She practiced anesthesiology until retirement in 1986. She also served on the St. Luke's Hospital governing board of trustees from 1984 to1992.

Faith Cramer Walsh, MD'48, a neurologist; Sept. 26. She graduated from the University of Pennsylvania Medical School in 1948 and started her medical practice as a neurologist in 1955. After spending her time doctoring in Morristown and Woodbury N.J., she retired to the Jersey Shore in 1991.

Robert Heal, MD'49, a physician; Sept. 25. He served in the U.S. Army during WWII, and attended Drexel Institute, Illinois Tech., and University of Minnesota. He graduated from the University of South Dakota School of Medicine with a BS degree in Medicine in 1947 and a MD degree from the University of Pennsylvania in 1949. After graduation, he interned at St. Vincent's Hospital in Indianapolis and had a general practice residency at Chester Hospital in Pennsylvania. He practiced family medicine there for 35 years, retiring in 1989.

1950s

Claude B. Henderson, MD'50, a psychiatrist; Oct. 11. He entered the Navy V12 program at Franklin and Marshall College, graduating with a BA. He went to medical school at the University of Pennsylvania. Following internship and residency, he served as a Navy medical officer (MD) for several years. Leaving active duty, he worked as a psychiatrist, first for the state of Florida in private practice, and later with the Veteran's Administration. Additionally, he served from time to time in the Navy Reserve, Army Reserve, and Florida National Guard, retiring from there as a Colonel.

Elizabeth Bishop Connell, BA'47, MD'51, a professor emeritus; Aug. 20. She was a researcher with the Centers for Disease Control and Prevention. She helped open a women's health clinic in East Harlem in the 1960s that is still active today as part of New York City's public hospital system, and she argued in favor of legalizing abortion well before the Supreme Court's Roe v. Wade decision in 1973. She also raised concerns about the risks of breast implants when she led a Food

and Drug Administration advisory committee. She graduated from the University of Pennsylvania's medical college in 1951. She began her medical career as a general practitioner. After training in surgery, she specialized in obstetrics and gynecology. In 1960, she moved to New York to complete a residency at Mount Sinai Hospital. She also joined the faculty at Columbia. In 1981, she joined the Department of Obstetrics and Gynecology at Emory University. She earned emeritus status in 2008.

Philip E. Duffy, MD, GME'52, a neuropathology professor; Sept. 21. He was a longtime professor at Columbia's College of Physicians and Surgeons and the discoverer of the mystery of ballet dancer George Balanchine's death. A graduate of Columbia College, and then of the College of Physicians and Surgeons, he interned at the Long Island Division of King's County Hospital, and served a residency at the Hospital of the University of Pennsylvania. He was a veteran of World War II, and served as captain during the Korean conflict. He was a professor, and later Director of the Division of Neuropathology at Columbia Medical School.

Joseph T. Michels, MD'52, an obstetrician/gynecologist; Aug. 30. He attended Mount St. Mary's College in Emmmitsburg, Md., and earned his medical degree at the University of Pennsylvania. He chose OB/GYN as his specialty, for which he trained at Mercy Hospital in Baltimore. He continued to practice there for over 40 years and participated in many hospital committees. He served as chief of staff at Mercy Hospital and president of the Maryland OB/GYN Society. He also served as a U.S. Air Force doctor from 1955 to 1956 in Tacoma, Wash.

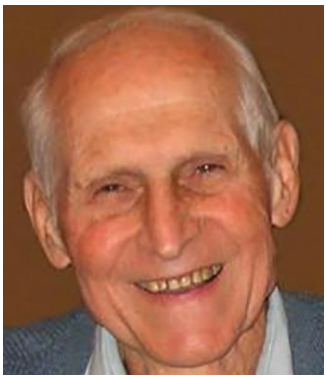
Philip "Rapid" Walling Brown, Jr., MD'53, PhD, a physician; Sept. 19. After two years at Dartmouth Medical School, he completed his last two years at the University of Pennsylvania, before interning at the Great Lakes Naval Hospital. Two more years of active duty followed, before he began his residency in internal medicine at the Mayo Clinic in 1956. Four years later, he was invited to join the staff. Research completed during this period led to his PhD from the University of Minnesota in 1966. For more than 35 years, he practiced medicine and gastroenterology.

Joseph Smith Bennett IV, MD'54, GME'60, a physician; Feb. 3. He earned his Bachelor of Science degree from Trinity College, Hartford, Connecticut in 1950. He attended the University of Pennsylvania School of Medicine and earned his medical degree in 1954. He held various positions including a rotating internship at Abington Memorial Hospital, internal medicine residencies at Pennsylvania Hospital and the Philadelphia Veterans Administration Hospital, and a gastroenterology fellowship at the Hospital of the University of Pennsylvania. He served as a Lieutenant in the U.S. Navy Medical Corps. He was the president of the medical staff at Paoli Memorial Hospital. In 1958, he founded his private practice which he grew until his retirement in 1997.

Edward Robert Dickstein, BS'50, MD'54, a physician; Dec. 3. He attended the University of Pennsylvania and was elected to Phi Beta Kappa in his junior year. He was a Lt. Commander in the U.S. Navy Medical Corps from 1954 to 1957, making 18 round trips from the United States to Germany as medical officer onboard. After his discharge from the Navy, he held residencies in internal medicine at the VA Hospital in Philadelphia, and at Philadelphia General Hospital, where he was awarded a fellowship from the American Heart Association. He was board certified in internal medicine with a sub-specialty in cardiology, and practiced medicine in Los Angeles for 55 years.

E. Ralph Heinz, MD'55, a pediatric neuroradiologist; Nov. 11. He attended West Virginia University. He was elected class president at University of Pennsylvania Medical School, and became chief resident in Medicine at Philadelphia General Hospital. He then became one of the first group of neuroradiology trainees in the U.S. at Columbia University. He went on to become the Chief of Special Procedures at Emory University, Chief of Neuroradiology at Yale University and ultimately, chair of Radiology at the University of Pittsburgh. He moved to Duke University to head the Neuroradiology division in 1978.

Nicholas Z. Kafoglis, MD'56, a politician; Feb. 9. He earned his BA from Yale University in 1952. After completing medical school at the University of Pennsylvania, he served as a captain in the U.S. Air Force Medical Corps. He established his medical practice in Bowling Green, Ky. In 1971, he ran for and was elected to the Kentucky General Assembly. In 1986, he ran for and won the 32nd District seat in the Kentucky State Senate, representing Warren and Logan counties. He was elected Senate Majority Caucus Chair by his colleagues.



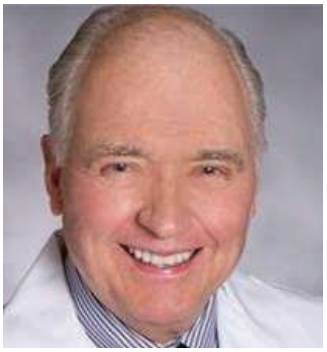
Ruth Addis Marcucci, MD, GME'58, a pediatrician; Sept. 17. She had a private practice in pediatrics from 1962 to 1993. She worked at Meadowbrook Pediatrics from 1994 to 1996. Educated at Temple University, Women's Medical College of Pennsylvania and University of Pennsylvania Medical School, she was class president for one year at Penn. She served her residency at Women's Medical College Hospital of Germantown.

1960s

Joseph Woolwich, BS'49, MD'61, GME'64, an anesthesiologist; Oct. 8. He was a Private First Class in the U.S. Army during WWII. He completed his mechanical engineering degree at the University of Pennsylvania and graduated in 1949. He continued as an Army reservist, from 1948 to 1953, achieving the rank of Second Lieutenant in the Quartermaster Corps. He did his internship at Abington Hospital and then completed his residency in anesthesia at the Hospital of the University of Pennsylvania. He worked at the anesthesiology group at Monmouth Medical Center where he practiced anesthesia until his retirement in 1990. He was an assistant clinical professor of Medicine at Hahnemann Medical College from 1982 to 1990.

F. Gene Braun, MD, GME'62, an ophthalmologist; Oct. 28. He was a proud graduate of North Catholic High School. He went to the University of Pittsburgh and graduated with a Bachelor of Science in chemistry and went on to complete medical school at University of Pittsburgh. He then did his internship at Shadyside Hospital. Following his internship, he proudly served his country in the Public Health Service as the ship's doctor and then as a doctor at an Indian Reservation in Lawton, Oklahoma. He then completed his ophthalmology residency at Graduate Hospital, University of Pennsylvania. He established his practice in Dallas.

J. Garry Beidler, MD'62, GME'67, a dermatologist; Dec. 30. He graduated from Bucknell University in 1958 and received an MD degree from the University of Pennsylvania in 1962. He completed his medical residency while serving in the U.S. Navy. He practiced dermatology in Chambersburg for 30 years.



Nile R. Lestrange, MD'62, an orthopaedic surgeon; Dec. 11. He graduated from Mount Lebanon High School in Pittsburgh, Pa., Bucknell University (magna cum laude), University of Pennsylvania School of Medicine, served as Captain in the U.S. Army, and completed a residency in orthopaedics at the University of Pittsburgh. He relocated to Fort Lauderdale and practiced Orthopaedics in Fort Lauderdale and Pompano Beach from 1970 until shortly before his death.

Remembering Joe Ensign-Lewis, MD'17

Joe Ensign-Lewis, MD'17, died March 30 in a car accident in car accident near Portland, Ore., where he was a second-year Psychiatry resident at Oregon Health & Science University.

During his time at PSOM, faculty and peers regarded Ensign-Lewis as a well-respected friend, student, and colleague. He was chosen by his peers "as an exemplar of humanistic patient care" and inducted into the Gold Humanism Honor Society. His passion for research during medical school led him to do a year after clinical rotations on immunology research at OHSU. He was a 2011 graduate of Brigham Young University, where he earned a B.S. in Exercise Science and served as the commencement speaker for his class.

An online fundraiser in Ensign-Lewis's memory notes that he was dedicated to serving and addressing the needs of families in crises and those experiencing homelessness; it surpassed its $10,000 goal for donations to benefit Portland Homeless Family Solutions.

Richard H. Rothman, BA'58, MD'62, PhD, an orthopaedic surgeon; Oct. 21. He was the founder of the Rothman Orthopaedic Institute and one of the first American surgeons to do hip replacements. He went to college and earned his medical degree at the University of Pennsylvania, and later received a PhD in anatomy at Thomas Jefferson University. In 1969, he traveled to England to train under Sir John Charnley, an early surgical pioneer in performing hip replacements. He served as the editor-in-chief and later emeritus editor of *The Journal of Arthroplasty*. He developed the Accolade total hip system. He served as vice chairman of the board of trustees at Thomas Jefferson University, and as a former trustee of the College of General Studies at the University of Pennsylvania. He was also on the Board of the American Academy of Orthopaedic Surgeons.

Joseph H. Edgar, Jr., MD'63, a physician; Jan. 9. He attended Rutgers University and received BS in Political Science in 1954. After the Army, he returned to Rutgers to earn a pre-med degree. He served as rotating intern at Philadelphia General Hospital. After three years in Internal Medicine at the VA Hospital in Philadelphia, he trained in cardiology at Maine Medical Center. He had a private practice in internal medicine and cardiology for 30 years in Portland. He served as president of the Maine division of the American Heart Association.

David B. Schaffer, MD'63, GME'67, an ophthalmologist; Nov. 4. He was a Major in the U.S. Army Reserve. He was still in his residency when the late Dr. Harold G. Scheie named him the director of Pediatric Ophthalmology at Children's Hospital of Philadelphia. He remained its department chair until his retirement. He was an accomplished medical photographer, co-authoring textbooks that included his medical photos. He was a member of the editorial and executive committees for the 1985 – 1999 Multicenter Trial and Outcome Study of Cryotherapy for Retinopathy of Prematurity.

Edward Armistead Talman, MD, GME'64, a surgeon; Oct. 31. He was a graduate the University of Virginia where he was Phi Beta Kappa and president of the Student Council. After graduating from UVA Medical School and following an internship in Boston, he served two years as a captain in the U.S. Army Medical Corps. He subsequently completed a five-year surgical residency at the Hospital of the University of Pennsylvania with Dr Jonathan Rhoads. In 1966, he joined the Surgical Associates of Richmond in the practice of general surgery. He served on the board of Chippenham-Johnston Willis Hospital for 30 years and was chief of Surgery at Johnston Willis for 11 years. He was a member of the Southern Surgical Association and president of the Virginia Surgical Society and the Eastern Surgical Society. Although he gladly accepted his appointment as clinical professor of Surgery at the Medical College of Virginia, VCU, he was a non-academic community surgeon.

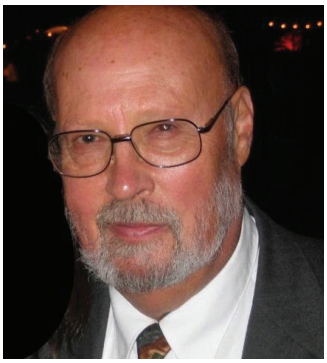
Matthew P. Mackay-Smith, GME'65; an equine veterinarian; Dec. 8. He went to Harvard University, where he earned his bachelor of arts degree in 1953. He received his degree in veterinary medicine from the University of Georgia in 1958, and went on to earn a master's degree in orthopedics and epidemiology from the University of Pennsylvania in 1960. He was the first large animal intern at the Penn School of Veterinary Medicine, where he taught for seven years. In 1967, he founded the Delaware Equine Center. Between 1961 and 2001, Mackay-Smith was the author/co-author of 22 professional papers and lectured widely on a host of equine veterinary subjects. He joined the American Association of Equine Practitioners in 1961 and served on the organization's Ethics, Racetrack, Education, Prepurchase, and Farrier Liaison committees. In 1977, while maintaining his medical practice, he became medical editor for the newly founded *EQUUS* magazine.

Michael Weintraub, BS'61, MD'65, a consultant; Aug. 21. After receiving two degrees from the University of Pennsylvania, he moved to Los Angeles for his internship in internal medicine at UCLA. In 1966, he joined the Peace Corps to serve as a physician in West Africa. In 1970, he moved to Rochester, N.Y. for a fellowship in clinical pharmacology. For over twenty years, he practiced clinical pharmacology at Strong Memorial Hospital at the University of Rochester. In 1992, he became the director of the FDA's Office of Drug Evaluation. After six years in the Washington, D.C. area, he returned to Rochester, where he worked as a consultant.

Colen C. Heinritz. Sr., MD, GME'66, a gastroenterologist; Dec. 11. He graduated from the University of Maryland in 1951 with his first Bachelor of Science in biology. After serving in the army, he went on to receive his Bachelor of Science in pharmacy in 1958 and his Doctor of Medicine in 1962 from the University of Maryland. He completed his fellowship at the University of Pennsylvania School of Medicine in 1966 specializing in gastroenterology. In 1967, he completed his residency in medicine at South Baltimore General Hospital (Harbor Hospital) where he went on to serve as chairman of the Gastroenterology Department, chief of staff, director of Continuing Medical Education, director of Internal Medicine, and director of the Transitional Residency Program.

Paul Harold Arkema, MD'67, a clinical associate professor; June 17, 2018. He graduated from Princeton University (magna cum laude) and the University of Pennsylvania School of Medicine. He trained in psychiatry at Massachusetts Mental Health Center and was a fellow in child and adolescent psychiatry at McLean Hospital. He graduated from the Boston Psychoanalytic Society and Institute as an analyst, and won its Felix and Helene Deutsch Prize in 1988. He was the resident premedical advisor at Winthrop House, Harvard College, and served in the Navy at the Philadelphia Naval Hospital (1971-1973), attaining the rank of Lieutenant Commander. He practiced adult, adolescent, and child psychiatry at Westwood Lodge Hospital from 1973 until its closure in 2017. He was a clinical associate professor of psychiatry at Boston University Medical School, and was recognized by the American Psychiatric Association with its Roeske Certificate for Excellence in Medical Student Education.

Gerrit J. Blauvelt, MD'67, GME'69, a psychiatrist; Nov. 11. He practiced medicine in San Francisco for nearly 50 years, beginning as an intern at Pacific Presbyterian in 1967. He was a member of the San Francisco and Northern California Psychiatric Societies and the San Francisco Psychoanalytic Institute, and served as an associate clinical professor at UCSF, where he taught the art of medicine. He was educated at University School, Yale College, and University of Pennsylvania School of Medicine. He continued his education with a psychiatric residency at Langley Porter, UCSF, followed by a fellowship. He served for 20 years as medical director of a geriatric program at the San Francisco Family Service Agency.



Edward T. Flynn, Jr., MD'67, a research associate professor of anesthesia; Feb. 9. He graduated from Farmington High School in 1959 and from Trinity College in Hartford in 1963. Following medical school, he joined the US Navy and embarked on a 27-year active duty career that included internship, and residency training in anesthesiology at the Naval Hospital, Bethesda Md., and fellowship training in respiratory physiology at the State University of New York at Buffalo. He retired from active duty in 1994 as the Commanding Officer of the Naval Medical Research and Development Command. He was twice awarded the Legion of Merit. Following retirement, he was appointed a research associate professor of Anesthesia at the University of Pennsylvania School of Medicine.

Patricia A. Gulbrandsen, MD'67, GME'71, a physician; Dec. 9. She received her BA from Cornell, MD from University of Pennsylvania School of Medicine, and MPH from Johns Hopkins. She did numerous residencies. She spent two years in England at Chelsey Hospital doing research. She was also recognized as a fellow by the Board of Occupational Medicine. She served in the Army as a Lt Col. in the Medical Corp.

1970s

Daniel A. Nesi, MD, GME'72; an otolaryngologist; Sept. 14. He was the former chief of staff at Doylestown Hospital. He served in the U.S. Army as the sole ENT surgeon for 25,000 troops and dependents. He was honored by Temple Medical School for his dedication, generosity and commitment to medicine and the donation of the Robert V. Nesi Student Union at Temple Medical School in honor of his late son and family. He also founded the Ann Silverman Health Clinic of Doylestown.

Sally J. Boyson, MD'79, GME'80,'83,'95, a neurologist; Oct. 2. She was educated at MIT and the University of Pennsylvania. She was an assistant professor of Neurology and Pharmacology at the University of Pennsylvania and later the University of Colorado, and volunteered teaching at the VA Hospital for many years.

1980s

Daniel A. Laurent, MD'81, a urologist; Nov. 27. He was a graduate of The United Nations International School, Brown University, and the University of Pennsylvania School of Medicine. He did his internship and residency in Washington, D.C., at the Georgetown University Medical Center and the George Washington University Hospital. After completing his residency, he opened his urology practice at Reston Hospital in 1987 where he practiced for 31 years. He served on the Reston Hospital board of trustees for 23 years and was board chair for eight years.

Kenneth Alan Bernhard, MD'82, a cardiologist; Dec. 14. He was a graduate of Princeton University and University of Pennsylvania School of Medicine. He served his internship and residency in internal medicine at Temple University Hospital and his fellowship in Cardiology at the University of Rochester, Strong Memorial Hospital, Rochester, N.Y. He worked as a cardiologist in Pittsburgh at Montefiore Hospital and in Allentown and Bethlehem. He worked at the Veterans Administration Outpatient Clinic in Allentown where he was an advocate for the veterans.

FACULTY

Sally J. Boyson, MD. See Class of 1979.

Edward T. Flynn, Jr., MD. See Class of 1967.

Robert (Bob) Gelfand, senior investigator and assistant director of core systems at the Institute for Environmental Medicine in the Perelman School of Medicine; Aug. 26. He joined the Navy in 1946 and served in the Navy

Reserves from 1948 to 1953 while attending Yale University, receiving a bachelor's in engineering in 1952 and a master's in electrical engineering in 1954. He joined the team led by undersea and aerospace researcher Christian Lambertsen, MD at the University of Pennsylvania, where he would spend his entire career. He started as an instrument designer appointed through the Moore School of Electrical Engineering (now SEAS) and was appointed assistant instructor, instructor, and associate in the Department of Pharmacology, and engineering supervisor, assistant director for Bioengineering, senior investigator, and assistant director for Core Systems in the Institute for Environmental Medicine. He served as project leader and principal investigator for projects associated with the National Heart, Lung, and Blood Institute, and was collaborating investigator for U.S. Navy Hyperoxia and NASA Research Projects.

James B. Hoyme, MD, a psychiatrist; Aug. 17. He graduated from the University of North Dakota in 1957 and received his medical degree from Wake Forest University School of Medicine in 1959. He completed his psychiatric residency at the University of North Carolina at Chapel Hill in 1965. He served as a commander in the US Naval Reserve at Camp Lejeune, N.C. from 1967 to 1969, then taught at the UND School of Medicine from 1970 to 1973 and was instrumental in starting several outpatient satellite psychiatric facilities in N.D. He then moved on to the faculty of the Medical University of South Carolina at Charleston from 1973 to 1984. In 1984, he became the medical director of the Institute of Pennsylvania Hospital until 1996 and remained in private practice in Philadelphia through 2015. He was a member of the American Psychiatric Association and a Senior Examiner for the American Board of Psychiatry and Neurology.

Harold Kolansky, MD, professor of psychiatry; Aug. 23. He practiced and taught psychiatry and psychoanalysis in Philadelphia for more than 65 years. He

was most recently the director of the Center for Psychoanalysis at Albert Einstein Medical Center and cinical professor of Psychiatry at the Perelman School of Medicine of the University of Pennsylvania.

Arthur "Drew" William Mellen, IV, MD, an obstetrician/gynecologist; Oct. 27. He attended Phillips Exeter Academy ('72) before matriculating to Harvard College ('76). He then studied medicine at Jefferson Medical College ('80), after which he completed his residency in obstetrics and gynecology at Pennsylvania Hospital, where he went on to practice as a physician for 33 years.

For More to Follow in their Path

When **Joseph S. Gordon**, C'53, M'57, GM'64, was just four years old, his physician grandfather looked at him and said, "You are going to be a doctor." At the time, Gordon didn't know what that entailed, but he would indeed follow in his father's and grandfather's footsteps.

Gordon's father, a Penn medical school (M'25) alumnus, encouraged him to go to the College for his undergraduate degree. Fascinated by the courses he took during his experience, he was inspired to pursue his MD at Penn. After graduating from the medical school, he served two years as an Air Force captain before returning to Penn Presbyterian as chief medical resident.

"I love the practice of medicine, and I had wonderful experiences at Penn," Gordon recalled. He was proud to serve on the steering committee for his 35th reunion, and makes annual gifts to the Medical Class of 1957 Scholarship they established.

Like Gordon, each student takes a distinct path to the Perelman School of Medicine. Today, financial realities play a role in shaping where the most exceptional students will enroll. Recognizing this, Gordon decided that the best way to ensure tomorrow's medical leaders continue to choose Penn to begin their medical careers was to augment his 39 years (and counting!) of annual giving by establishing a legacy gift in his will.

The planned giving office provided Gordon with the language he needed to include a bequest to the Perelman School of Medicine in his will. Adding a bequest to support medical scholarships is easy to do with a codicil—there's often no need to rewrite an entire will or undo a comprehensive estate plan.

"Young people entering the School of Medicine, whether in research, teaching, clinical practice, or all three, should have the opportunity to pursue their medical degrees, and that's why I do my part," Gordon said. "Penn made me a doctor, and I appreciate that. I feel good being able to give back to Penn education."

> Scholarships are the foundation upon which Penn Medicine and our world-class medical advances are achieved. Establishing a scholarship fund in your family name is an easy and tax-wise way to give to the Perelman School of Medicine. Scholarship funds can provide a significant impact on students over a few years or can be created to endure for all time, helping generations of students flourish as Penn physicians, researchers, and leaders in academic medicine. To discuss giving options, please contact Christine S. Ewan, JD, senior executive director of planned giving, at 215-898-9486 or cewan@upenn.edu.

For more information, please visit our website at: www.pennmedicine.org/plannedgiving.

3 QUESTIONS ON THE FUTURE OF MEDICAL EDUCATION

BY HANNAH MESSINGER
PHOTO BY PEGGY PETERSON

Just over a year into her role as senior vice dean for medical education at the Perelman School of Medicine, Suzanne Rose, MD, MSEd, shares her perspective on what the future holds.

1

What are the top five trends shaping the future of medical education?

First, there is the explosion of scientific information.

Second, the health care delivery system itself: how health care has changed, and the ways in which education has had to keep up with the rapid pace of that change.

Third, adult learning theory: how we now better understand how adult learners learn, allowing us to make education more pertinent to our students.

Fourth, the demographics: not just the demographics of our patient populations, like older patients and those who have had multiple illnesses, but also the demographics of our diverse learners themselves.

Last but not least, there's technology: its impact on the care of patients and in the delivery of education.

2

What's the biggest challenge in facing these trends?

Many of these trends are already incorporated into our curriculum. The biggest challenge is content reform; we can't keep just adding things to the curriculum. With the explosion of scientific information, there's unlimited material to learn, but if we keep adding material to our curriculum, our students will not have a free minute in their day.

Looking ahead, trends in curriculum are about more integration, rather than single topics, such as a two- week course on women's health, when there could be a longitudinal four-year curriculum on the topic!

We're heavy on lectures, and that's something that many students and faculty like. But we have to figure out if we can do even better as we know that lectures are not the most effective method for learning. For example, can we give a lecture in 10-15 minutes in what I like to call "tapas-size" lectures, as opposed to long, 60-minute lectures? This could help students become more active learners as we incorporate more small group discussions and team learning which is so highly valued by our students.

The No. 1 competency for a medical student is to figure out how to say, "I don't know," and having the skills to go out and learn it, and then apply it.

Eventually, we'll dedicate time with faculty, students, and staff to think about what parts of our curriculum we need to keep and what aspects need to evolve. We have to figure out what the basic knowledge is that our students need to make diagnostic and clinical decisions.

3

What does the future of medical education look like to you?

The future is bright! I'm optimistic every time I talk to our students. I tell this to my family members: don't worry about getting sick and the care you will receive, because the doctors of the future are going to be fantastic!

Our students are coming in with incredible values and talent, unlike anything we've seen before. Our job as educators is to nurture their talent, while balancing their wellness and their commitment to their values. And if anything, our job is to enhance their commitment to humanistic care as they become leaders in science and discovery, and leaders in clinical medicine.

From what I see here at Penn regarding the leadership skills of our students, no matter what field they go into—whether it's the business of medicine or a clinical endeavor—Penn students are going to change the world.

And the impact we have on our medical students is going to be paid forward thousands and thousands of times over for each student. Each of them, over their careers, is going to help so many people, whether it's their mentees in the lab or their patients.

That impact is a big responsibility for Penn as an institution and for me as the person in charge of education—but it's also a privilege. It's incredible. ⛉

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Lights! Camera! Match Day!

As she counted down the days to Match Day, fourth-year medical student Amanda Labora shared her medical school experience, and her hopes and aspirations, as part of a special video series. Catch the class's Match Day celebrations in the final video, and read Labora's interview with Obstetrics & Gynecology Chair Deborah Driscoll, MD, as part of the new #WomenOfPenn blog series, among the variety of online pieces that go beyond this issue's cover story (p. 12).

Find all the extras at PennMedicine.org/magazine

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