

PENN Medicine



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Building Discovery into Hospital Design

Gail Morrison, Medical Education Leader,
Plots Her Next Chapter

THE PREP

Prepared for Extremes



Students simulate treating patients in a chemical contamination disaster.

Simulated mass-casualty disasters and traumatic injuries in remote wilderness locales are all part of the training.

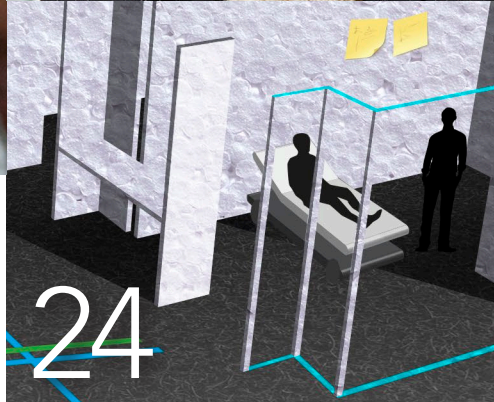
“No amount of working on paper is going to guarantee your plan works in a real situation,” Peter Sananman, MD, told a dozen fourth-year medical students who sat, dripping, in a bright yellow emergency tent. They were debriefing a disaster simulation exercise they had found frustrating—not enough staff, stretchers, or information to make the best decisions. And that was the point.

In this two-week elective course in wilderness and disaster medicine developed by Sananman, an associate professor of Emergency Medicine, the challenge is to balance medical and technical skill with situational awareness to help patients no matter how difficult the real-world situation. Students learn to flex those muscles in a variety of hands-on settings, from underwater in the pool to the mountains of a New Jersey wilderness camp.



Taking turns to pose as victims, practicing a wide variety of rescue scenarios helped students prepare to coordinate care when facing unexpected and extreme situations.

Find more photos online and read about a recent grad's dramatic rescue experience using skills from the course, at PennMedicine.org/magazine/wilderness



DEPARTMENTS

- Left THE PREP**
Prepared for Extremes
- 2 EDITOR'S NOTE**
All the Better for Listening
- 3 VITAL SIGNS**
Bioethics Program Milestone
- 10 MEDICINE PLUS**
A Doctor Who Packs a Punchline
- 40 DEVELOPMENT MATTERS**
Insider's Look at Advances in Florida
- 42 ALUMNI NEWS**
Progress Notes and Obituaries
- 44 FUTURE PROGNOSIS**
Bringing Psoriasis Treatment Home

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SPRING/SUMMER 2018 / VOLUME XXIX NUMBER 2

- 12** Correcting a Blind Spot | *By Queen Muse*
A groundbreaking genetic study seeks to transform the prevention and treatment of glaucoma while reversing historical racial disparities in who suffers from the disease and benefits from such research.
- 20** Beyond the Walls | *By Rachel Ewing*
At the apex of her decades of transformative leadership, Gail Morrison, MD'71, GME'76, has one piece of unfinished business: transforming medical education on the internet.
- 24** Architects of Innovation | *By Christina Hernandez Sherwood*
The Pavilion at the Hospital of the University of Pennsylvania is rising as a towering example of the value of behavioral research in health-care building design.
- 32** A Gospel from Clay and Dust | *By S.I. Rosenbaum*
Raegan McDonald-Mosley, MD'04, MPH, found her calling during medical school to fight a "needless form of mortality" facing women. Recently, that struggle put her in the national spotlight.

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All the Better for Listening

“Listen to your patient; he is telling you the diagnosis.” This oft-cited quote from Sir William Osler, the 19th-century physician and chair of Clinical Medicine at the University of Pennsylvania, references the central importance of taking a history in medical care. There is no question that listening during the one-on-one clinical encounter endures at the heart of medicine. But listening is also a vital tool in many modern medical endeavors that Osler might never have imagined. The stories in this issue of *Penn Medicine* show how, across a variety of domains, even the supposed experts do well to step back and acknowledge when they don't have all the answers. When we listen to others, all of medicine is better for it.

The painful history of racial inequity and past abuses of minority populations in medicine is part of the backdrop in this issue's cover story (p. 12). It's part of the reason why most large genetic studies have failed to include many people whose ancestry is non-European. As researchers at the Scheie Eye Institute sought to engage African American populations in a large genetic study of glaucoma, they did not limit themselves to just the biological questions at hand. They made a point of asking why the process of enrolling African American patients was uniquely challenging. They listened to the patients who chose to enroll in the study and to those who chose not to, and why. As a result, they learned about better opportunities to engage communities in research that will benefit them, and they translated that insight to make changes—such as demonstrating that saliva sample was equally as effective as a blood sample in providing the genetic data they needed. As a result, some potential participants who said they were hesitant to give blood but otherwise willing, were able to be part of the research. Future discoveries will be better for it.

Listening is central to the story of the innovative design process for the Pavilion, Penn Medicine's new inpatient facility slated to open in 2021 (p. 24). The team of architects and designers have integrated the views of clinicians and other front-line staff at every stage of the design process, even building a warehouse-sized mockup of a patient floor for these staff to practice their work in the new space. Clinical care in the new facility will be better for it.

And this issue also highlights a beloved Penn Medicine figure who could be fairly named our institution's Listener-in-Chief. Gail Morrison, MD'71, GME'76, shifted this year from her role as senior vice dean of medical education into leadership of a new initiative focused on online education. As our story on p. 20 relates, Morrison has made listening



to constituents a vital and ongoing process in her leadership, including in the initial planning of the overhaul of the medical education curriculum more than 20 years ago and the continuous process of feedback from faculty and students that has continued to shape the curriculum ever since. Medical education continues to get better and better.

Because listening is so important, I want to take this moment to remind readers that we want to listen to your feedback to bring you the best possible *Penn Medicine* magazine we can. If you have not already done so, please help us by answering our reader survey online at PennMedicine.org/magazine/survey2018. You may also call the Penn Medicine communications department at 215-662-2560 to request a paper copy of the survey. I look forward to hearing from you. ☐

RE

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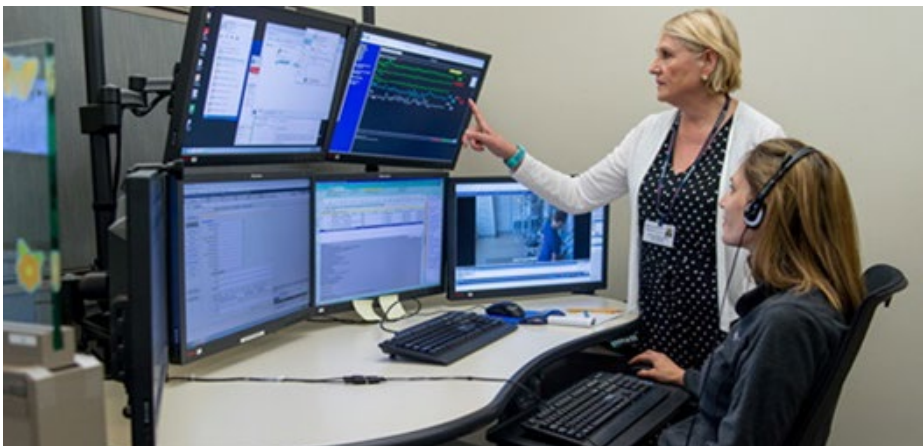
Penn's New Center for Connected Care Forms Largest Regional Telehealth Hub

The new Penn Medicine Center for Connected Care has been established to centralize the health system's telemedicine activities. The center addresses the ever-growing demand for easily accessible telehealth services. It combines the almost 15-year-old Penn E-lert eICU for the critically ill, a tele-homecare service for the chronically ill, a telemedicine service linking obstetricians to trauma surgeons caring for critically injured pregnant women, and a tele-urgent

care service which eliminates the need for physical visits in some cases.

"Connected care allows us to bypass the constraint of needing the patient to come to us in order to get the best medical care," said C. William Hanson, III, MD'83, GME'89, Penn Medicine's chief medical information officer.

"We're bringing the highest level of care to the greatest number of people: the right care in the right place at the right time."



Located at Penn Medicine Rittenhouse, the Penn Medicine Center for Connected Care is the largest telehealth center in the region and one of the largest telehealth hubs in the country. Its 50 full-time employees work together to support patients 24/7 as well other Penn Medicine staff in a variety of settings across Pennsylvania, New Jersey, and Delaware.

Penn Medicine also provides a growing array of telemedical specialty services in fields such as transplant services, dermatology, ophthalmology, radiology, adolescent and young adult medicine, sleep medicine, and complex neurological conditions to patients at a regional, national, and international level. Other telemedical specialty services include post-operative surgical visits in various specialties as well as hematology oncology consultations and veteran's mental health services. An additional suite of programs provide specialized, academic medical center-based services to patients who live outside Penn Medicine's typical service region. For example, a telegenetics program through Penn's Abramson Cancer Center provides genetic counseling for patients living with or at-risk of inherited conditions via remote video conferencing.

New Regional Alliance Emphasizes Population Health

In April, the University of Pennsylvania Health System, Mercy Health System of Southeastern Pennsylvania (Mercy) and St. Mary Medical Center (St. Mary) announced an alliance to focus on the development of joint clinical care programs and population health initiatives to improve health care throughout the Greater Philadelphia region.

Mercy, St. Mary and Penn Medicine will partner to improve the care of the population served in Pennsylvania's Bucks, Delaware and Philadelphia counties while facilitating access to Penn Medicine for Mercy and St. Mary patients' tertiary and quaternary health care needs. The alliance will also focus on developing joint clinical care programs, such as cancer care, cardiology and surgical services in Bucks County and the surrounding areas. In West Philadelphia, the partnership will also explore similar clinical programs and improve upon regional population health initiatives exploring gaps in preventive care, and provide improved access to care for patients with high-risk, high-cost health conditions.

"We are excited to work with these new partners to develop innovative public health programs and initiatives that will offer patients continued access to high-quality care close to home, as well as advanced care at Penn Medicine hospitals when needed," said Ralph W. Muller, CEO of the University of Pennsylvania Health System.





MATCH DAY

It was standing room only—and barely enough room to stand—at the first Perelman School of Medicine Match Day ceremony to be held in the bright and airy Henry A. Jordan M’62 Medical Education Center. Hundreds of family members, friends, and classmates looked on from multiple levels of the atrium to share in the anticipation and celebration. One by one medical students from the class of 2018 had the opportunity to come to the stage and receive the envelope whose contents revealed where they would go for their residency training.

“Opening these little envelopes is kind of like opening the doors into our careers as physicians,” said graduating MD/MBA candidate and 2016 Pat Tillman Scholarship recipient Jonathan Wood. “It’s great to celebrate with classmates. We each decided to enter careers in medicine for different reasons and now after four years of learning and growing together, I am excited for all us to continue on our unique paths to careers in medicine.”

Wood, who had served for eight years in the Air Force before entering medical school, matched with Lancaster General Hospital for a residency in family medicine—proof, he said, that it’s never too late to pursue your passion.



Perelman School of Medicine Class of 2018



158

Graduates

48



Graduates to train at Penn, CHOP, or the Scheie Eye Institute



58%

obtaining “MD plus” dual degrees or certificates

5



graduates pursuing careers in business or research

TOP 3
Specialties:



Internal
Medicine



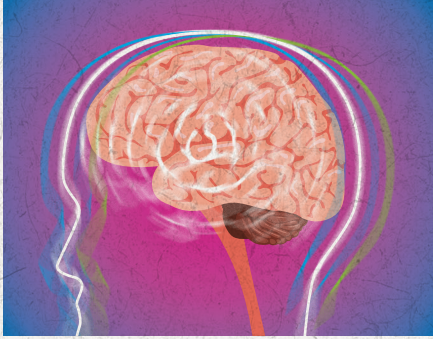
Pediatrics



General Surgery

Keyword Cheat Sheet

A few terms to know from recent Penn Medicine research

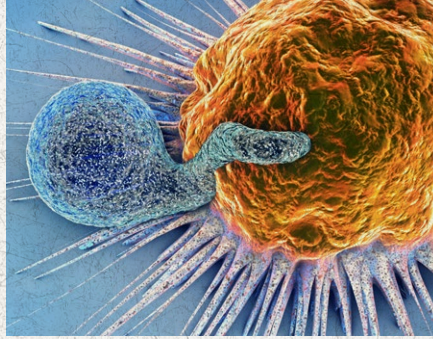


CONCUSSION symptoms were remarkably similar to those seen in U.S. government personnel who were evaluated at Penn's Center for Brain Injury and Repair after experiencing audible phenomena while serving in Havana, Cuba. The researchers reported in *JAMA* that the symptoms represent a potential new neurological syndrome involving persistent memory and thinking dysfunction, as well as vision and balance problems.

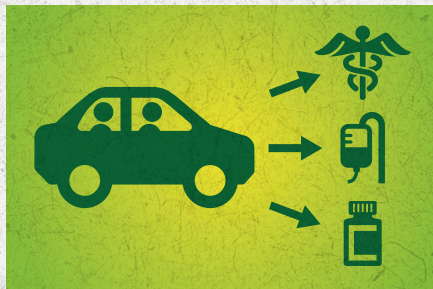


Stacie Leigh Bumgarner

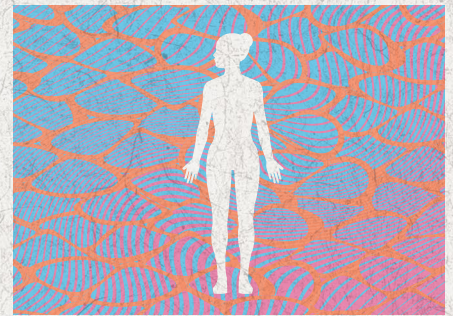
AN ICEBREAKER SHIP works in a manner analogous to a transcription factor protein called TCF-1, which opens a path for other transcription factors to access DNA in a developing T cell. The ice in this analogy is condensed chromatin that keeps DNA tightly wrapped. The findings were published in *Immunity*. The new connection between TCF-1 and chromatin will aid in developing new therapies using epigenetic drugs to alter T-cell fate in cancer, autoimmune disorders, and infectious diseases



"HIDDEN RESPONDERS" among cancer patients are those whose tumors might respond to certain therapies, but whose tumors don't have the specific genetic marker that is known to indicate that susceptibility. A Penn Medicine team publishing in *Cell Reports* found that these patients can be pinpointed via artificial-intelligence. The upshot is that the transcriptome, or collection of messenger RNA active in a person's cells, is underused in bringing precision to oncology, but when combined with machine learning it can aid in identifying potential hidden responders.



RIDESHARING, a relatively simple, inexpensive approach to address transportation barriers—may not be the easy fix some believe it to be for the problem of patients missing medical appointments. When the service was offered for free to low-income patients, it did not improve the rate of missed appointments, according to a Penn study published in *JAMA Internal Medicine*.



THE INTERSTITIUM is a previously unknown feature of the human body that has potential implications for the function of most organs and for the mechanism of many diseases. This system of interconnected, fluid-filled compartments lies below the skin's surface, lining the digestive tract, lungs and urinary systems, and around arteries, veins, and the space between muscles. The research team from Penn, Mount Sinai Beth Israel Medical Center, and the New York University School of Medicine, described their finding in *Scientific Reports*.



SATISFACTION—not educational outcomes—changes when resident physicians' work hours are limited to 16-hour work shifts, compared to "flexing" them to allow for some longer shifts, according to a study published in the *New England Journal of Medicine*. While residents were satisfied with the limited hours, their training directors were more dissatisfied with curtailed educational opportunities. The study is part of a major, five-year effort in which researchers surveyed and tracked the activities of thousands of first-year residents in 63 internal medicine training programs nationwide.

Honors & Awards



Jill M. Baren, MD, MBE'06
Professor, Emergency Medicine, Pediatrics, and Medical Ethics

American Council on Education (ACE) Fellow

The ACE Fellows Program identifies and prepares faculty and staff members for senior positions in college and university administration through a cohort-based mentorship model.



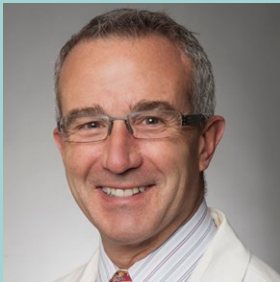
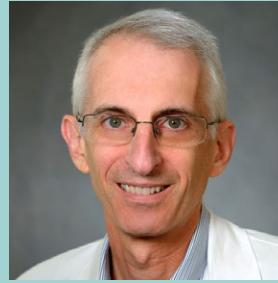
David S. Goldberg, MD, MSCE'11
Assistant Professor of Medicine and Epidemiology

Michael L. Kochman, MD
Wilmott Family Professor of Medicine

James D. Lewis, MD'91, MSCE'98
Professor of Medicine and Epidemiology

American Gastroenterological Association (AGA) Awards

Goldberg received the AGA's Young Investigator Award in Clinical Science for his work on liver disease epidemiology and outcomes in liver transplantation. Kochman was awarded AGA's Distinguished Clinician Award, Clinical Academic Practice for his clinical, technical, and interpersonal skills as an interventional endoscopist. Lewis received the AGA's Distinguished Educator Award for local and national contributions over a lifelong career.



Jeffrey S. Berns, MD
Professor and Associate Chief, Renal-Electrolyte and Hypertension

Donald W. Seldin Distinguished Award from the National Kidney Foundation

For excellence in clinical nephrology.



Charles L. Bosk, PhD
Professor, Anesthesiology and Critical Care (PSOM), and Sociology (School of Arts and Sciences)

Guggenheim Fellowship

Bosk studies the social and cultural dimensions of health care; he will use his Guggenheim to work on his forthcoming book, *Mistakes Were Changed: An Ethnographic History of Medical Failure*.



Joseph A. DiRienzi
Pathologists' Assistant and Lead Medical Pathology Coordinator, Pathology and Laboratory Medicine

National Disease Research Interchange 2018 Service to Science - Outstanding Tissue Procurement Partner Award

DiRienzi was cited for his "unparalleled blend of compassion and excellence" in biospecimen procurement by the nonprofit organization that is the nation's leading source of human tissues, cells, and organs for scientific research.



Shinjae Chung, PhD
Assistant Professor of Neuroscience

Iain Mathieson, PhD
Assistant Professor of Genetics

Sloan Fellowships

The highly competitive award, granted to 126 recipients this year, recognizes early-career scholars who are extraordinary scientific researchers with significant potential.



Ezekiel J. Emanuel, MD, PhD
Vice Provost of Global Initiatives; Chair, Medical Ethics and Health Policy

2018 Dan David Prize

The award recognizes and encourages innovative and interdisciplinary research and achievements having an outstanding scientific, technological, cultural or social impact on our world.



Edna B. Foa, PhD
Professor, Clinical Psychology in Psychiatry;
Director, Center for the Treatment and Study of Anxiety

Carol Johnson Humanitarian Award

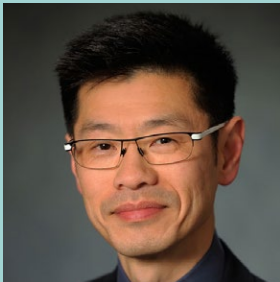
Presented by Women Organized Against Rape (WOAR), Philadelphia's rape crisis center, the award recognizes "outstanding commitment to making [the] community safer for victims of sexual assault."



Raina Merchant, MD, MSHP'09
Associate Professor, Emergency Medicine;
Director, Center for Digital Health;
Associate Vice President, University of Pennsylvania Health System

Editorial Board Member, JAMA

For a 3-year term that began in January 2018, Merchant serves as an advisor to the editor in chief and contributes to the editorial content of the most widely circulated and one of the most prestigious peer-reviewed medical journals in the world.



James C. Gee, PhD
Associate Professor, Radiologic Science;
Director, Penn Image Computing and Science Laboratory

American Institute for Medical and Biological Engineering (AIMBE) College of Fellows

Gee was elected for outstanding contributions to advanced medical image registration and analysis methods. Election to the AIMBE College of Fellows is among the highest professional distinctions accorded to a medical and biological engineer.



Jamie Shuda, EdD
Director of Life Science Outreach, Institute for Regenerative Medicine

Genetics Society of America 2018 Elizabeth W. Jones Award for Excellence in Education

Shuda was recognized for outstanding contributions to science education, including BioEYES, a K-12 science education program that provides classroom-based, hands-on lessons in basic scientific methods, biology, and genetics using live zebrafish.

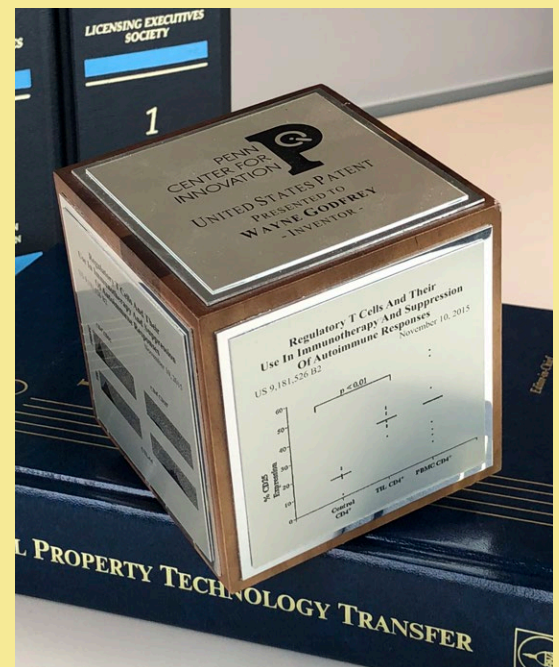
Outstanding Inventors

In an academic year that has already seen first-in-class approvals by the Food and Drug Administration of cellular and gene therapies invented at Penn, there is still more advances to celebrate. In 2017 alone, inventors from across the University received a total of 111 patents—the highest ever in a year since the Penn Center for Innovation (PCI) started counting. At PCI's second annual Celebration of Innovation, these Penn inventors each took home a pin and a personalized cube representing their patents. A few innovators from the Perelman School of Medicine received more honors.

Yvonne Paterson, PhD, a professor of Microbiology, received the Inventor of the Year honor. As was highlighted in *Penn Medicine* (Fall 2016), Paterson holds numerous patents for techniques that are advancing toward clinical therapies.

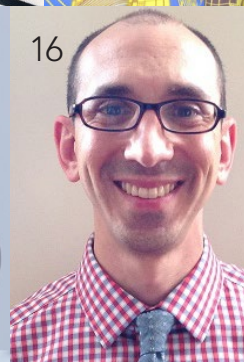
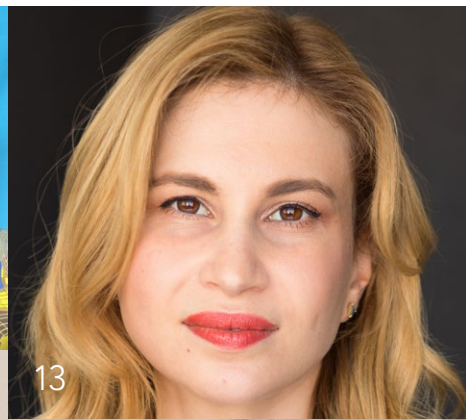
Daniel Powell Jr., PhD, an associate professor of Pathology and Laboratory Medicine and of Obstetrics and Gynecology, was named the 2017-18 Emerging Inventor of the Year in recognition of his numerous inventions related to T-cell manufacturing and improvements to CAR T cell therapies.

In addition, Drew Weissman, MD, PhD, a professor of Medicine in Infectious Diseases, was honored for Deal of the Year in recognition of the 2017 license restructuring between Penn and mRNA Ribotherapeutics and sublicenses to BioNTech and another large biotechnology company.





20 at 20: Longstanding Bioethics Master's Program Milestone



Penn's interdisciplinary Master of Bioethics (MBE) program

is one of the nation's premier programs for bioethics education, attracting exceptional students from both the U.S. and abroad—and it is one of the longest-running such programs, now celebrating its 20th anniversary year. What better way to explore and celebrate the program's remarkable impact than by getting to know a sampling of its diverse graduates?

These 20 individuals exemplify what the MBE and a bioethics-focused approach can bring to a variety of disciplines. The program's alumni includes professionals in clinical medicine, including doctors and nurses focused on issues of fertility and the start of life (2, 10, 19), care at the end of life (5, 7, 16), and at every point in between (1, 11, 12). "I believe that applying bioethics in any field is a life-long process that evolves with one's career,"

- 1. Anthony J. Mazzaelli, MD, JD'02, MBE'02**
Co-President, Cooper University Health Care; Associate Dean of Academic Affairs, Cooper Medical School of Rowan University
- 2. Pasquale Patrizio, MD, MBE'03**
Professor of Obstetrics, Gynecology, and Reproductive Sciences; Director, Yale Fertility Center and Fertility Preservation Program; Teacher, Yale Center of Bioethics and Medical Ethics
- 3. David Sontag, JD, MBE'03**
First Deputy General Counsel and Co-Chair, Ethics Advisory Committee, Beth Israel Deaconess Medical Center (BIDMC); Lecturer on Medicine and Center for Bioethics Faculty, Harvard Medical School (Photo by Lipofsky)
- 4. Wendy Sue Swanson, MD'03, MBE'03**
Chief of Digital Innovation, Seattle Children's Hospital
- 5. Salimah Meghani, MSN'01, PhD'05, MBE'05**
Associate Professor of Nursing and Term Chair of Palliative Care, University of Pennsylvania School of Nursing
- 6. Jason Schwartz, PhD'12, MBE'06**
Assistant Professor of Health Policy and the History of Medicine, Yale University (Photo by Nathan Mitchell)
- 7. Erin Talati Paquette, JD, MD, MBE'07**
Assistant Professor of Pediatrics and Critical Care, Feinberg School of Medicine at Northwestern University; Associate Chair Ethics Advisory Board, Ann & Robert H. Lurie Children's Hospital of Chicago
- 8. Mark Swope, MDiv, PhD, MBE'07**
Director, Medical Ethics for Carilion Clinic & Assistant Professor at Virginia Tech Carilion School of Medicine
- 9. Sheldon Sloan, MD, MBE'08**
Immunology Global Medical Affairs Leader for Inflammatory Bowel Disease at Janssen
- 10. Kavita Shah Arora, MD, MBE'09**
Assistant Professor of Reproductive Biology and Bioethics, Case Western Reserve; Director of Quality, MetroHealth Medical Center
- 11. Mary K. Walton, BSN'74, MSN'81, MBE'10, RN, FAAN**
Director, Patient and Family Centered Care, Hospital of the University of Pennsylvania (Photo by Will Connelly)
- 12. Renatha Joseph, MD, MMED, MBE'12**
Lecturer and Head of the Bioethics and Health Professionalism Department, Muhimbili University of Health and Allied Sciences (MUHAS)
- 13. Robyn Schneider, MBE'12**
Novelist and Screenwriter (Photo by Emily Sandifer)
- 14. Emily Kramer-Golinkoff, BA'07, MBE'13**
Co-Founder, Emily's Entourage
- 15. Kholoud Alnakshabandi, MD, MBE'14**
Demonstrator, Psychiatry Department, King Saud University (Photo by Abdullah AL Musharraf)
- 16. Joshua B. Kayser, MD, MPH, MBE'14**
Associate Professor of Clinical Medicine and Medical Ethics, Perelman School of Medicine; Director, Medical Intensive Care Unit & Section Chief, Medical Critical Care, Cpl. Michael J. Crescenz VA Medical Center
- 17. Mehrin ("Mir") Masud-Elias, JD, MBE'15**
Executive Director of Legal Affairs & Immunotherapy Collaborations, Abramson Cancer Center (Photo by Jamal J Elias)
- 18. Margaret Landi, VMD'79, MBE'16**
Chief Veterinarian and VP of the Office of Animal Welfare, Ethics and Strategy at GlaxoSmithKline
- 19. Maj. Jason Unsworth, MDiv, MBE'16**
Bioethics Instructor - U.S. Army Medical Department Center and School at Fort Sam Houston, Texas
- 20. Michael S. Weinstein, MD, MBE'16**
Associate Professor of Surgery, Sidney Kimmel Medical College at Thomas Jefferson University Co-Chair of Hospital Ethics Committee, Thomas Jefferson University Hospital (Photo by TJU Photography Services)

► **Read more about all 20 online at**
PennMedicine.org/magazine/ss18vs



A DOCTOR WHO PACKS A PUNCHLINE



By Rachel Ewing
Photos by Graham Perry

What lessons can comedy offer to psychiatry?

If you've been to a psychiatrist, or even just watched a therapy session on TV, you've probably had a moment of wondering what exactly that clinician is thinking about while quietly taking notes as a patient spills their innermost thoughts. Behdad Bozorgnia, MD, MAPP, a fourth-year and chief resident in Psychiatry at Penn Medicine, is prepared to tell you: "The thing I spend the most time thinking about as a psychiatrist is how to appear contemplative without appearing constipated," he says. That's a joke.

Bozorgnia, who has performed stand-up comedy in the past and continues to hone his funny bone through humorous writing, will be the first to tell you that joking, especially as a doctor, isn't easy. But if you make the effort, he argues, comedy has some valuable lessons for the practice of psychiatry.

Words Matter

In one of Bozorgnia's earliest classes in the subject, he recalls, the instructor advised that psychotherapy requires merely "saying the exact right thing at

the exact right time." While that task is far from a simple one, the same challenge applies in comedy, Bozorgnia says—getting the wording just right to set up the context of a character, tell a story, build anticipation. "It's a lot about understanding the subtleties and effects of words," he says. "The deeper I get into psychiatry the more I realize that. Words have a lot of power. You have to think about how it's going to change the particular relationship you have with someone."

Rooted in Relationships

Comedy is rooted in relationships for Bozorgnia. After his family emigrated from Iran to the U.S. when he was a

child, he used his penchant for entertaining as a way to fit in: “I realized, as a second grader, these Americans like to laugh, and I’ve got to win them over, so if I can know how to make them laugh, I can make more friends.” He practiced his jokes, reworking the ones that fell flat, and watched a lot of stand-up comedy as he grew up. In college, at Wesleyan, a friend encouraged him to get into stand-up, and they formed a troupe called Punchline that performed frequently on campus venues. After graduating, he found a few more opportunities to perform—an open-mic night in South Carolina where he “wasn’t booed off the stage but wasn’t received very well, either,” and a performance or two at the Laugh Factory in Philadelphia, where he says the best joke during his time on stage was one made by the next comedian coming on to follow his set. (And it was at his expense.) Now, Bozorgnia mainly expresses his comedic interest through writing.

The *Penndulum* Swing

What drew Bozorgnia to writing, and to psychiatry itself—he initially favored family medicine—was storytelling. In psychiatry, the patient’s narrative of their behavior is part of their illness and part of their treatment. In writing, Bozorgnia tells his own stories, such as an essay about the shock of his first experience working on an inpatient psychiatric unit. In such stories, he likes to build in punchlines to keep things engaging and light. “It’s helpful in psychiatry because we have to deal with a lot of dark themes,” he says. “I think having a sense of humor both helps you explore that and also kind of protects you from having to live through that all the time.”

The same is true of *Penndulum*, a literary magazine he co-founded and edits with his best friend, Lisa Jacobs, MD, GME’17. Comedy isn’t one of its main selling points. Originally conceived as a magazine by residents, for residents, *Penndulum* now draws submissions of writing and art from medi-

cal students and physicians at all levels, nurses and other health care providers, and even patients, from across the country. The publication tackles heavy subjects that are often hidden and hard to talk about—burnout, mental anguish, and all the difficult points of conflict in medicine.

“One of the things humor allows people to do is be really honest about what makes them uncomfortable,” Bozorgnia says. “That’s I think what *Penndulum* tries to do, too, to get people to be really honest.”

Conflict in Comedy

There’s a problem with comedy in medicine. It’s often pretty bad. But it’s bad for a good reason.

One of Bozorgnia’s favorite punchlines in medical school was just the phrase “classic doctah humah”—that’s “classic doctor humor” said with a thick affected New York accent—to punctuate the silence after anyone in his vicinity made a bad or corny joke. “Doctor humor is often very, very dry and based on puns and things like that,” he says. “It’s hard to be really funny and a doctor at the same time because there are a lot of expectations of professionalism.”

Using the kind of sharp honesty that underlies a lot of humor (other than puns), while being careful not to wield it as a weapon that causes patients harm, is a difficult balancing act. “We’re constantly trying to work through that dynamic,” Bozorgnia says. “I’m trying to work through it right now as I’m talking.”

The Lesson of Surprise

Despite these challenges, for Bozorgnia, there are lessons to learn from comedy that help with the practice of psychiatry. It’s a learning process he plans to take with him as he completes his residency this summer and moves on to his new role as an attending psychiatrist with the Veterans Administration.

“It’s sort of a verbal sleight of hands,” he says, of comedy. You lead people in one direction and set up an expectation

of some serious statement—and then you puncture it with something totally unexpected, a punchline. There’s a formula: Expectation, surprise, laugh, feel good.

“Psychiatry is a lot about a similar thing, sometimes defying people’s expectations,” Bozorgnia says. As he sees it, patients who are caught in an unhealthy pattern of behavior are paving their own well-established path of expectations, acting out a script that evokes a predictable response from each person they encounter. A psychiatrist’s job, then, is to deviate from the

One of the things humor allows people to do is be really honest about what makes them uncomfortable.

path and change those expectations. If a patient is trying to anger him, instead of taking the bait, Bozorgnia observes, calmly, “It seems like you’re trying to make me angry.” That unexpected response can surprise the patient and, sometimes, open the door to insight into their own behavior.

The trick is understanding the comedic formula and adapting it to a new purpose: Expectation, surprise, reflect, and start to behave differently.

“I think that psychiatry and comedy are ultimately about getting people to confront uncomfortable truths in a way that doesn’t feel too painful,” Bozorgnia says. “Or at least also feels enjoyable as well as painful.”

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A groundbreaking genetic study seeks to transform the prevention and treatment of glaucoma while reversing historical racial disparities in who suffers from the disease and benefits from such research.

The human eye is a wonder. It is the second most complex organ in the human body, outranked only by the brain, and is responsible for transporting visual cues that help process everything from images and memories to thoughts and speech. Doctors who study the eye often find themselves tracing winding pathways among the more than 1 million tangled nerve fibers that connect each eye to the brain. Its inscrutability led some early physicians to theorize that the pupil was nothing more than an indecipherable black hole.

Glaucoma, one of the most debilitating diseases of the eye, is a mystery unto itself. For the more than 3 million Americans living with the disease, there are often no warning signs, no nagging flashes of light or foggy gray circles obstructing views. There is no pain. Then slowly, over time, sharp images may reduce to narrow vignettes; the central portrait is still somewhat recognizable, the outer edges, an infinite blur. Simple tasks like reading and writing may require magnifying devices. For some, daily rituals like driving and shopping become impossible to complete without assistance, until one day, everything fades to black.

With open-angle glaucoma, the form affecting roughly 90 percent of glaucoma patients, everything seems fine until it isn't; once vision loss occurs, it can't be reversed.

There is no cure. Its cause is unclear. And though efforts to understand such vision losses date back as far as Hippocrates, much about glaucoma remains a mystery to both the patients living with it and the doctors and scientists who are working to treat it.

It wasn't until the mid-1800s that the invention of a small handheld device made of half-silvered mirrors and glass plates revolutionized the study of the human eye. The ophthalmoscope enabled early physicians to examine previously obscure parts of the eye and detect dysfunction in central and peripheral vision. In 1862, a Dutch ophthalmologist using the ophthalmoscope identified a connection between high intraocular pressure and blindness, making it possible to diagnose the onset of the condition now known as open-angle glaucoma.

More than a century and a half later, while the ophthalmoscope has seen many functional upgrades, the treatment of glaucoma has remained remarkably similar over time, with the main treatment options focused on lowering the pressure in the eye. But, today, a major study is also using modern genetic science to advance understanding of the disease—and upending a longstanding disparity in who benefits from such research at the same time.

FOLLOWING THE PATH OF GENETICS

For nearly two years, Kevin Richardson, 52, had been experiencing blurry vision and trouble focusing when reading. Knowing that glaucoma runs in his family—his grandmother had been diagnosed with the disease during her final year of life—in late 2017, Richardson came in to the Scheie Eye Institute at Penn Medicine for an eye exam.

“It's kind of scary,” he said with a pause, seriously pondering the gravity of his potential risk. “No one wants to lose their eyesight. So I knew I had to come in and find out what it meant for me.”

During his visit, Richardson was approached about enrolling in a study. He would have to provide a DNA sample, and his genes would be sequenced to identify possible genetic variants that might contribute to the risk of glaucoma. He gladly agreed to participate.

“I said yes because I was curious to know more about glaucoma,” he said. “And they all seemed like they really cared about helping me. They went into detail, explaining how everything would work.”

The study Richardson is taking part in is a large and ambitious one, known as the Primary Open-Angle African American Glaucoma Genetics (POAAGG) study. It launched in 2014, when Joan O'Brien, MD, the director of the Scheie Eye Institute and chairman of Ophthalmology at Penn Medicine, received an \$11.2 million grant from the National Institutes of Health (NIH). Led by O'Brien as principal investigator with co-investigators Privthi S. Sankar, MD, Eydie Miller, MD, Victoria Addis, MD, and Qi Cui, MD, PhD, the five-year study seeks to identify genetic risk factors that contribute to a disproportionately high incidence of primary open-angle glaucoma (POAG) among African Americans.

The study aims to not only correct a health disparity, but to keep Penn Medicine and Penn patients like Richardson at the forefront of transformations in ophthalmology that are bringing precision to the understanding and treatment of eye disease.



Eydie Miller, MD, a co-investigator of the POAAGG study, said she's proud to be a part of a study that focuses exclusively on African Americans, who have historically been neglected in genetic research.

Precision medicine—a fairly novel approach that looks to genetic information to create specialized treatments for an individual's clinical care—is one of the biggest buzzwords of the last decade in medical research. It has worked wonders in the study of cancer, transforming understanding of the disease and enabling doctors to use information about the mechanism of disease to determine which treatment will work best for each patient.

O'Brien, the leader of the POAAGG study, has a track record of bringing precision approaches to ophthalmology, having studied the genetics of ocular cancers such as ocular melanoma and retinoblastoma since the late 1980s following her days at Dartmouth Medical School. Her training included an internship in internal medicine (Beth Israel Hospital), residency in ophthalmology (Harvard's Eye and Ear Infirmary), and fellowships in immunology and ophthalmic pathology (Harvard Medical School), in genetics (Weinberg Lab of the Massachusetts Institute of Technology's Whitehead Institute), and in ocular oncology (University of California, San Francisco—UCSF).

When she later served as a professor, vice chair of Ophthalmology and director of the Ocular Oncology Division at

UCSF, much of O'Brien's NIH-funded research focused on identifying unique pathogenic variants in the retinoblastoma gene (*RBI*) in an effort to establish targeted therapies to treat the disease based on each patient's underlying genetic risk. This work resulted in new retinoblastoma therapies

being offered nationwide to patients. O'Brien also worked with dermatopathologist Boris Bastian MD, PhD, to identify *GNAQ* and *GNA11*, genetic variants associated with uveal melanoma. This work was published in *Nature* and the *New England Journal of Medicine*.

When O'Brien moved to Philadelphia in 2010 and became the eighth chairman of Ophthalmology at the Perelman School of Medicine at the University of Pennsylvania, she hoped to make another similar impact through precision medicine.

"When I came here, I wanted to establish a good infrastructure to take research from bench to bedside to benefit patients," O'Brien said. "So, I wanted to investigate a disease to address an unmet need in Philadelphia."

It didn't take long to find. O'Brien and her team noticed a staggering number of particularly young African American residents, many in their 30s and 40s, who were coming to their practice in West Philadelphia seeking treatment for moderate to severe vision loss.

"It was really frustrating to see someone in the prime of their life be disabled in that way," recalled Prithvi S. Sankar, MD, a professor of Clinical Ophthalmology. "It was heartbreaking."

OVERBURDENED, YET UNDERREPRESENTED

The local cases seemed to mirror national statistics. Glaucoma is the leading cause of irreversible blindness in the world today. As studies show, African Americans are four to five times more likely to have glaucoma than Caucasians. Glaucoma also tends to appear earlier and progress faster in African Americans. Open-angle glaucoma can occur when drainage canals in the eye become clogged over time, leading to increased eye pressure. Because the disease progresses slowly over time, over half of the individuals living with the disease are unaware that they have it.

It is unclear why African Americans are more frequently affected with more severe cases of the disease than other ethnic populations or groups. In many cases, racial and ethnic disparities in health can be attributed to social causes, in-



With a mobile glaucoma screening bus funded by the POAAGG study, Scheie Eye Institute physicians and staff conduct free community screenings at community centers, churches, and health fairs across the city, including this North Philadelphia health fair.

cluding the persistent impacts of inequality in income, housing, education, access to health care, and more. When it comes to primary open-angle glaucoma, strong correlations exist between the disease and family history. O'Brien noted that an individual's risk of developing glaucoma increases up to tenfold when a parent or sibling has the disease. This pattern holds true in high-risk populations of African descent, yet the genetics of the disease in general are poorly understood. O'Brien therefore believes that key answers that could offer benefits to African American patients who are disproportionately burdened with glaucoma may lie in novel genetic research.

Now, with the POAAGG study, the researchers aim to enroll a large study population, especially for a study focused on a minority group: 7,765 African American patients, including 3,000 with primary open-angle glaucoma and 4,765 controls.

O'Brien admits it has been an ambitious undertaking, one with many potential barriers and challenges.

The study is unusual for more than just its size. Historically, genome-wide association studies (GWAS) of this kind have failed to include populations of African descent or other minority groups in the North American and European research centers where many of these studies have been conducted to date. A 2016 study published in *Nature* found that only 3 percent of GWAS participants were of African ancestry. GWA studies serve as the primary tool for identifying genetic variants in individuals to see which, if any, variants are associated with disease traits. People whose an-

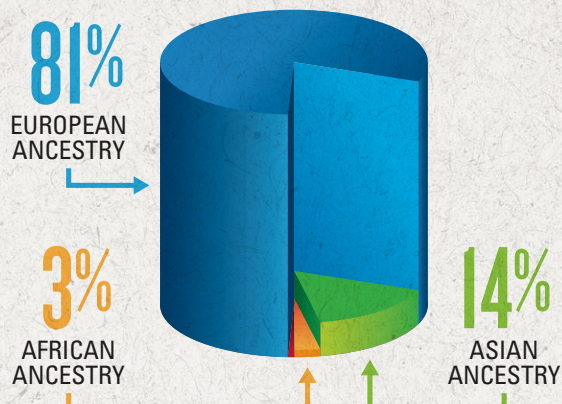
cestry did not go through a genetic bottleneck in Europe may have the same genetic variants with a different frequency than in European-descended populations, or a broader range of variants in some cases—so when GWA studies focus so narrowly, the understanding of the genetic basis of disease can be incomplete. And because they've been historically left out of these studies, populations, such as African Americans, whose ancestry does not primarily trace back through Europe, are less likely to benefit from precision medicine.

Eydie Miller, MD, argues that part of the reason why African Americans have been underrepresented in GWA studies in the past is investigator bias; researchers may have thought African Americans would not participate and opted not to seek or include them. Miller, a professor of Clinical Ophthalmology and director of the Glaucoma Service at the Scheie Eye Institute, wasn't shy about stating her belief that it is "inherently unfair to exclude from GWA studies the population that has the most disability from this disease." Miller, however, said she's proud to be a part of a study that focuses exclusively on this historically neglected group.

There are other reasons, too, that have made the researchers' goal of recruiting more than 7,500 African Americans a formidable pursuit.

The underrepresentation of African Americans in GWA studies may also be attributed to the community's deep-seated distrust of medicine. O'Brien points to the Tuskegee Experiment and the controversy surrounding HeLa cells as prominent instances where African Americans have been

LACK OF DIVERSITY IN LARGE SCALE STUDIES



A 2016 analysis published in *Nature* by researchers at the University of Washington found that people of European ancestry continue to dominate genome-wide association studies. Their analysis comprised more than 2,500 studies with 35 million genetic samples. A mere 3 percent of those samples came from people with African ancestry.

Data source: Popejoy & Fullerton, *Nature*, October 2016.

treated unfairly by members of the medical community. This history has led to population-wide hesitation toward participating in medical studies.

Miller said some of the patients she attempted to enroll expressed concerns about participating in this and other studies, considering the history of exploitation as a source of medical knowledge that benefits only white patients. “Some were definitely concerned about the history of research studies with people of African descent and whether there is equity and fairness in terms of diagnosis and management of data dating back to the Tuskegee experiment,” she said.

BUILDING NEW ROADS TO RECRUITMENT

In the early stages of recruitment for the study, O’Brien’s team found success in reaching out to willing patients like Richardson. The hope was that the grassroots, word-of-mouth approach to outreach would render results.

Sankar admits that, early on, he worried that they might not meet their enrollment goals.

“I think there was this sense within the African American community that they didn’t want to be used as guinea pigs, considering all of the things that have happened in the past,” he said.

To address patients’ concerns of this nature, Miller said, “we go the extra mile in letting them know that their privacy is being respected,” describing details of how data is de-identified to protect participants from insurance discrimination based on genetic risk, and emphasizing the integrity of the process.

In the first year, the researchers were able to recruit a cohort of more than 2,500 participants, the largest African-American primary open-angle glaucoma population recruited at a single institution. To date, more than 9,500 participants have enrolled in the study—in excess of the targeted 7,765 participants, accounting for a number of individuals who had suspected but unconfirmed glaucoma at the time of enrollment. Recruitment is ongoing.

Getting to this point has entailed a broad-based, large-scale outreach strategy. O’Brien’s team began by tapping their closest resources for support, partnering with several local ophthalmologists who volunteered to open their clinics to the study, giving access to a broader pool of patients. An additional 1,600 patients were recruited from the Penn Medicine Biobank, a collection of DNA samples from more than 40,000 Penn patients who have consented to have their DNA used in research studies across the University.

The team also worked to ensure that the study was minimally invasive. In the past, large genetic studies have avoided obtaining DNA samples from saliva because blood samples were considered to be more reliable. But a 2016 analysis published by members of O’Brien’s research team proved that saliva collection is an equally viable alternative to blood collection.

Two years into the study, the researchers replaced blood sample collection with saliva sample collection, a change that Sankar says served as a major benefit to enrollment. Knowledge gained from this change in collection method

Individuals of African descent who have been diagnosed with glaucoma and are interested in participating in this study can call 215-709-9308 to learn more.

might also help future genetic studies to be more successful in enrolling patients who might otherwise be hesitant to have their blood drawn to participate.

“People don’t like getting blood drawn,” he explained. “So, being able to have them spit into a tube instead, that was a huge advantage from our standpoint and it bolstered our recruitment significantly.”

The team then began what O’Brien likes to refer to as ‘in-reach’ or reaching into the community to connect with groups in forums and settings that they typically would not have access to.

Their efforts led to the creation of a screening clinic at Scheie and a mobile glaucoma screening bus. Both were used to conduct free glaucoma screenings at community centers, health centers, retirement communities, and churches throughout the city, enrolling eligible volunteers in the study along the way.

In February 2018, the team began partnering with *WURD*, an African-American owned and operated talk radio station in Philadelphia, to launch a new multimedia awareness campaign. Radio commercials, digital ads, and flyers offer a



A community member at a health fair undergoes a near visual acuity test.



Joan O'Brien, MD, director of the Scheie Eye Institute, is principal investigator of the POAAGG study. She has a track record of bringing precision medicine approaches to ophthalmology.

phone number for people diagnosed with glaucoma to sign up for the study. Eligible callers are scheduled for appointments at the Scheie Eye Institute, which include free exams and second opinions from glaucoma specialists. “We are hoping this initiative will not only help with study recruitment, but also in developing stronger relationships with the Philadelphia community and raising awareness about glaucoma,” said Ava Kikut, who manages the campaign.

Researchers’ efforts to make a personal connection with the people in the communities they serve have been key to recruitment from the beginning, Miller said. The work hits close to home for her; her mother and several relatives from both sides of her family were diagnosed with glaucoma.

“I’m African American, so when I talk to patients, I put a personal emphasis on it. I let them know that I understand what they’re going through because it runs in my family, too. I try to help them understand that better glaucoma management lies in being able to have a better understanding of the genetic basis of the disease,” she said. “And when I explain to them the good that this will do for their families in the future, they are actually much more open to the idea; they see the bigger picture; they know they’re not being experimented on.”

The researchers emphasized to patients that because the genetic study is seeking a basic understanding of the disease, they may not see an immediate impact in new treatments for themselves—but many patients were pleased to be a part of research that would benefit future patients.

“Anything that might be hereditary is important for people to know,” said Janet L. Williams-Brown, 75, a long-term

patient of Scheie and POAAGG study participant whose mother was diagnosed with glaucoma, putting Williams-Brown at a higher risk for having the disease. “I think participating is a good way to pay it forward. I have eight sisters, five brothers, and 32 nieces and nephews; I want them to benefit from this research.”

AN EXPANDING SPECTRUM OF GLAUCOMA

As O'Brien's team approaches the final year under the NIH grant, current Lab Director and Research Project Manager at the Scheie Eye Institute, Harini Gudiseva, finds herself at the helm of a massive undertaking. The researchers have begun a comprehensive analysis of data collected over the past four years. Another approach to genetic analysis, whole exome sequencing, is planned for the entire cohort in the coming months.

The hope is that the collected data will confirm their original hypotheses: that genetic variants influence the risk of POAG and the traits related to that risk, such as intraocular pressure and corneal and retinal nerve fiber layer thickness; and that demographic and ocular risk factors, and medical co-morbidities also contribute to the increased risk of POAG in African Americans.

Two years into the study, the team initiated a GWAS to identify the most frequent genetic variants among the first 5,500 enrolled patients. The GWAS enables the researchers to identify variants with a significant association with

open-angle glaucoma, as well as variants associated with variables such as intraocular pressure or retinal nerve fiber layer thickness along with other specific glaucoma traits.

In addition, recent studies have indicated possible links between glaucoma and dysfunction in the mitochondria, the energy-generating organelles inside cells that carry distinct DNA that is passed directly from mother to child, unlike the DNA in the cell's nucleus that mixes genes from both parents. To investigate these potential hereditary links, O'Brien's team is also using the collected data to study variants in mitochondrial DNA (mtDNA).

O'Brien's team has now begun the meticulous work of dividing their study participants by haplogroups, which are the known and named lineages of mitochondria through which people can be genetically grouped according to their maternal inheritance. (Because mtDNA changes only through mutation, variations in mtDNA can be used to group populations traced back through maternal lines to ancestral points of divergence when different mutations first appeared. See more about mitochondrial genetics in *Penn Medicine*, Fall 2017.) This process will help determine which risk factors are most likely to be found among specific haplogroups; and will ultimately, O'Brien hopes, become one portion of a risk model for POAG in African Americans.

"Once we identify a participant's haplogroup, we can see—depending upon which haplogroup they're in—the level of risk they might be facing," O'Brien explained.

The team's early findings seem to confirm their hypotheses that glaucoma, much like cancer, is not one, but many diseases with various underlying causes and genetic differences.

The researchers have produced several publications and have more in preparation that will elucidate the study's final results in the coming months. In the meantime, O'Brien says, the group may have already made significant progress in identifying variants that may be linked with a higher risk of developing more severe cases of glaucoma.

"We're still in the process of confirming this, but there appears to be a variant that's associated with more rapid progression, younger age, and lower pressures," she said.

Further, the team's early findings seem to confirm their hypotheses that glaucoma, much like cancer, is not one, but many diseases with various underlying causes and genetic differences. If this is proven to be true, the researchers hope

to create named subcategories to identify the various types of glaucoma they encounter. This could enable them to develop precision, targeted treatments for each form of disease.

"Right now, if we look into an optic nerve and see any kind of atrophy, we're going to call it glaucoma. But if we were neurologists, and we found an abnormality in the brain, we'd do a scan and depending on what we found we might call it frontotemporal dementia or Alzheimer's or some other neurological disorder," she explained. "Our early findings indicate that we have to begin to look at glaucoma in the same way. Atrophy of the optic nerve in glaucoma will sometimes coincide with more generalized atrophy seen in dementia. This likely represents a different clinical subtype of glaucoma which demonstrates different genetic markers."

S P U R R I N G FUTURE DISCOVERY

The POAAGG study—just on the basis of the richness and scale of the data it has collected to date—is likely to spur many future studies of glaucoma as well as fuel collaboration across disciplines to create new treatments for the disease. This, Miller said, is the ultimate goal of the study.

"We're starting that work by looking at genetics and we're doing the standard treatment in our office but there are lots of pharmacologists, people who design devices and a whole cadre of people that are necessary to treat any medical disease," Miller said. "So we want to open up the door for all these other investigators to try to find a better way to prevent blindness."

Using the POAAGG study data, researchers will be able to explore an array of topics related to disease progression, family history, and risk factors for blindness. Perhaps most importantly, O'Brien argues, the study represents a significant step in closing the gap of underrepresentation of non-European populations in important genetic studies.

In any study, there is of course the possibility that the researchers will be unsuccessful in proving their hypotheses; the POAAGG study is no exception. After a moment of pause, O'Brien acknowledged her ambivalence about the potential outcomes.

"I think this department has an amazing faculty who really want to help their patients in every way. This study is just one example of that," she said. "If we don't find really significant variants, I think it would be unfortunate. On the other hand, we'll have gathered all of this very useful genetic information. So, hopefully some young scientist can use that information to do some groundbreaking work on other diseases that affect this population in the future. Let's reverse this negative history in science and let's make this a city where the most overaffected population becomes the most studied population."

► [Read this study online with related links at PennMedicine.org/magazine/blindspot](http://PennMedicine.org/magazine/blindspot)

Beyond the Walls

By Rachel Ewing

At the apex of her decades of transformative leadership, Gail Morrison, MD'71, GME'76, has one piece of unfinished business: transforming medical education on the internet.

In the heady, early days of popularized dial-up internet, when the phrase “World Wide Web” was common parlance and programmers raced the clock to squash Y2K bugs, change was in the air. Gail Morrison, MD'71, GME'76 had recently overhauled the University of Pennsylvania's entire medical curriculum into a novel format that was modular, interdisciplinary, technology-driven, and flexible. But that wasn't all she envisioned. Now she wanted to take the concepts behind that curriculum and reach out to the world of medicine beyond the students enrolled in the four-year MD program on Penn's campus. The internet-connected wave of the future was rising. It would be a “school without walls.”

Plans were drawn up, domain names registered, university approvals secured. The brochures were printed before the dot-com bubble burst on Wall Street, the \$10 million funding to launch the project disappeared.

Morrison's track record of success was unmarred, though; two decades later, she is without question a nationally recognized innovator and leader in medical education. The Y2K iteration of the “school without walls” would barely merit a footnote, if not for the fact that Morrison never abandoned the vision behind it. This February, she passed the torch of her longtime role as senior vice dean of medical education at the Perelman School of Medicine to Suzanne Rose, MD, MSED, and took on a new title of executive director of the

Innovation Center for Online Medical Education and special advisor to the executive vice president/dean. Now, she hopes, the walls are coming down.

Curriculum 2000

“What we are doing now is an outgrowth of Curriculum 2000,” Morrison says, a large iced coffee on the table beside her, a mix of calm optimism and determination in her voice. She is taking time out to connect the dots of her legacy while juggling a pile of decisions to be made about technologies, outreach strategies, collaborations, collecting tuition.

Curriculum 2000, the massive overhaul of how medical students learn over the course of four years, launched in 1997 under Morrison's leadership, early in a wave of curricular reform at a few of the country's top medical schools.

“The curriculum up to that point of time had been very much siloed into normal, abnormal, and clinical,” she says. Recognizing that physicians and researchers already worked across department lines to solve clinical challenges—pharmacologists with physiologists, physiologists with biochemists—she saw that medical students needed to learn according to a plan that from its start was similarly integrated “without walls,” and one that was coordinated to avoid repetition. The curriculum thus had a modular structure, with major ideas grouped by theme, rather than by academic discipline.

Grouping education into modules, along with technological innovations of a virtual classroom with all lectures available via online video, gave medical students more flexibility and freedom with their time. After their core clerkship rotations, from January of their second year through December of their third year, they had room in their schedule for electives, scholarly pursuits, and what Morrison dubs the “MD plus” degree that could be anything from a Wharton MBA to a certificate in global health. The number of certificate programs available to medical students ballooned from two when Morrison took the helm to nine today, and master's degree programs from two to 10. Today, more than a third of the 2018 class are “MD plus” graduates.

But arguably the idea tying Morrison's curriculum transformation together, and the one most relevant to her next project, is that it prepares medical students and physicians to keep themselves up to date as self-directed, lifelong learners.

“That was one of the founding pillars of the curriculum, and it's even more so today,” says Anna Delaney, the chief administrative officer and head of academic programs. “There's just too much content out there. They can't possibly learn it



Photo by Peggy Peterson

all.” And so, learning how to find answers was built in: “We give them the tools, we give them the time, and we test them.”

Finding the Answers

“In 1950, it took 50 years for the amount of medical information to double,” Morrison says, during a conversation in the glass-encased meeting room in the Henry A. Jordan M’62 Medical Education Center (JMEC) that bears her name, thanks to her gift to the school honoring its 250th anniversary. She pauses then to think of the rest of the oft-cited statistic she’s reaching for—and pulls out her iPhone to look up the paper where it was published. By 1980, that doubling of medical knowledge occurred in just seven years, she recites, and in 2010, that time was halved. In 2020, it’s projected to happen in the space of 73 days.

“That changes how you think about what you need to teach people,” she says. It necessitates the mindset—one she already sees in her own daughter and her medical school classmates—that you have to carry your smartphone or tablet everywhere, to pull out that phone and look up the relevant paper so you find the right information at the right time. What you think you already know is just a starting point.

And the key question for educators: “How do medical schools become part of helping people try to keep up?”

In this domain, Morrison does not claim to have all the answers. But she does have a track record of finding answers to vast, ambitious challenges. In 1976, when she joined the Penn faculty in the renal division, she was asked to set up a dialysis program. After a pause, she said, “Okay. What’s a dialysis program?” Then she agreed to do it.

“That was the beginning of me going, ‘Hmm, okay. Well, I’ll go ask a lot of people a lot of questions and try to see what I can do,’” she recalls. She continued to take on other challenges in the Department of Medicine and for the school and national groups. In the mid-1990s, the curriculum transformation to revolutionize how medical students learn for the 21st century was the biggest challenge yet. She knew that the principles of interdisciplinary integration, flexibility, and an emphasis on humanism in the profession would all be key. To get there, she got people together and listened to what they needed. She had basic science and clinical faculty sit down together and figure out what problems they needed to solve. “When it came to either medicine or education, I felt comfortable I could find the right people and listen and ask enough questions and figure out what we could do,” she says. “It just seemed to work.”

Listening on an ongoing basis remains part of the curriculum’s strength. “One of the things we do here that’s quite unique,” says Stanley Goldfarb, MD, the associate dean of curriculum, “is the fact that we have weekly meetings with the students to review the curriculum in real time.” Additionally, Goldfarb notes, a large curriculum committee involving all faculty members who run a course—about 80 in total—weighs in on decisions that affect student learning.

That constant curricular review is “ahead of its time,” according to Kate McOwen, MSED, the director of educational

affairs at the Association of American Medical Colleges (AAMC). For the past nine years at AAMC, McOwen has worked with Morrison, Goldfarb, and their counterparts nationally; she previously worked at Penn. “Curriculum 2000 was certainly a leader and in many ways continues to lead the pack,” she adds. “If you look at the landscape of medical education today, many schools have been going through either a curricular refresh or a redo. In all of those cases, the integration of basic sciences and clinical experience is top of mind; everyone is doing that earlier, and Penn was one of the first.”

Pilot Projects

Theoretically, Morrison thinks she only wants to work three more years before she retires. That is what she told the dean last year, saying she wanted to transition her role as senior vice dean smoothly to a successor during that span. And so the Innovation Center for Online Learning sparked into existence with the follow-up question: What else could she achieve during that transition? Morrison said she thought Penn Medicine could do better at disseminating the information created here outside the institution’s walls, to practicing physicians and to the world beyond medicine.

As with Curriculum 2000, in launching the new center, Morrison knows a few key principles that are essential to her goals. Now she is bringing people together, asking enough questions to figure out what to do, and trying out a few ideas while soliciting feedback on what does or doesn’t work well. Several different pilot projects for online education have launched this spring or are scheduled for later in 2018. There’s an online class on the business of medicine, a collaboration with Wharton, open to people in both the business and health care realms. There are online anatomy classes offered via Penn’s College of Liberal and Professional Studies for post-baccalaureate and graduate students to strengthen their scientific background for health sciences careers. And then there is the vast area of continuing education for working physicians and other health care providers: Another pilot program will offer continuing education and accreditation credit for anesthesia providers, both doctors and nurses, who need to provide safe anesthesia in outpatient settings for common procedures such as endoscopies.

In planning these ventures, Morrison began with listening to what providers need and want. Every year at Penn’s Medical Alumni Weekend, Morrison observes, she meets alumni who are enthralled with the lectures and seminars they attend there. “I want conferences like these at Penn, and I want these Grand Rounds,” they’ve told her, but those who practice outside of academia said that nothing comparable was available to them. And she’s continuing to listen. As they plan for future programs, Morrison and her team are planning to survey 5,000 Penn faculty members to learn what they need to know and what they would like to learn through online educational offerings. They are thinking about packages of materials for continuing medical education by specialty and for primary care, with an eye toward reaching wider



Seen here during construction of the South Pavilion tower of the Perelman Center for Advanced Medicine, the glass-encased Jordan Medical Education Center (with slanted roof and terrace at center) is physically interconnected with the Penn Medicine clinical and research enterprise.

communities of practicing physicians with the information they need, right at the time that they need it.

Those are real needs for which online education is an area of active growth nationally that is “100 percent necessary,” says AAMC’s McOwen. “What people are grappling with nationally is how to do [online medical education] well. We rely on leaders like Penn and leaders like Gail to blaze the trail and help us learn. I’m actually excited to see what she comes up with.”

An Open and Connected Place

The question of a door arose during the process of planning the Jordan Medical Education Center before it opened in 2015. The airy glass-encased hub of medical student activity is centrally located on Penn’s medical campus, but at five stories up, it’s arguably tricky to find.

“But we’re talking about integrating something into the entire health system,” Morrison says. And when you make a separate door, you are building a wall, she realized. That separate entrance would tell medical students that what they do is separate from the clinical enterprise and separate from research. “The mantra became, no, we don’t want a separate door,” she says. “And the fifth floor was great because of the views, and because we could connect it to all this outside space, and we could connect it to [the Smilow Center for Translational Research], and we could connect it to [outpatient facilities at the Perelman Center for Advanced Medicine], and we’re going to connect it to the new hospital Pavilion.”

The airy and interconnected spaces in JMEC are now constantly in demand, not only by groups hosting events on campus, but also by leaders of other medical schools. The

latter group brings architects who want to find inspiration for their own new medical education facilities.

The atrium here was also the site where Morrison has been feted in recent months with high honors from her peers at the medical school. In December, she received the Elizabeth Kirk Rose M’26 Women in Medicine Award. In March, before fourth-year medical students received their residency matches, Dean J. Larry Jameson, MD, PhD, took a moment to acknowledge Morrison’s service to medical education and impact on the thousands of physicians who gained from her leadership, mentorship, and vision—and the estimated 10 to 12 million patients receiving care from those physicians today. He gave her two dozen red roses before a standing crowd’s applause. In May, she was not only the Perelman school’s commencement speaker, but the fifth-ever recipient of its alumni lifetime achievement award.

But even with that lifetime of achievement to celebrate, Morrison still has eyes set on the opportunities ahead, on the thousands, hundreds of thousands, or more people working in medicine who need to keep learning, who aren’t necessarily walking through any doors on Penn’s campus.

“It’s not going to happen overnight,” she says, “and you’re going to have to have a lot of people working to move it along. But that’s what we did with the curriculum. We had close to 150, 200 people when we were building the curriculum. I just had to get them at the same table, working together. Smart people. And once that happened, I could pull back completely.” □

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ARCHITECTS OF INNOVATION

By Christina Hernandez Sherwood

Photos by Addison Geary *except where noted*



The Pavilion at the Hospital of the University of Pennsylvania is rising as a towering example of the value of behavioral research in health-care building design.

On a February day in 2016, architects, designers, contractors and Penn Medicine employees gathered in a Market Street conference room to assess their progress on the Pavilion, the inpatient hub planned for the Hospital of the University of Pennsylvania (HUP).

The team had spent months on a meticulously thought-through design of the massive, 1.5-million-square-foot facility. They had worked collaboratively, bringing together Penn Medicine’s own clinical experts with architecture, design, and construction professionals who specialize in health care, and they had relied on the latest research about how to organize clinical care spaces to be effective for both clinicians’ and patients’ needs—for example, incorporating so-called “onstage” and “offstage” zones, which put staff in front of or out of view of patients, respectively. They had even spent months of work and hundreds of thousands of dollars on the construction of a 30,000-square-foot mockup of half an inpatient floor and offered tours for hundreds of employees—and in their first set of surveys, respondents frequently endorsed many of the building’s design details as “ideal.” Now the design team was ready to hear the results from another, more involved tour of that foam-and-cardboard space to decide if the initial design of the Pavilion’s inpatient floors was truly viable.

The verdict: It wasn’t. By and large, Penn Medicine clinical and support staff who spent hours in the mockup running through simulations of their day-to-day workflows gave certain key aspects of the plan a thumbs down. Among the criticisms: Certain hallways weren’t wide enough. Just 42 percent of simulation participants felt patient bathrooms

were designed to accommodate staff assistance. And only about half of visitors to the mockup thought the dedicated patient elevators were optimally located.

After the presentation, the design team had some positive attributes from their original plan they knew to keep—but to address the criticisms, they began again. “We always knew we were going to be making some changes, but not to the extent we ended up doing,” said Stephen Greulich, senior project manager. “We didn’t think we’d be redesigning the building.”

Yet while this rejection might sound like a failure, the Pavilion design process was working exactly the way it was intended. The multilayered process of creating this new hospital building uses behavioral research to guide design choices at each step. That meant asking the people who would work in the new hospital how they thought it should be designed, listening to their feedback, and testing their assumptions. As a result, when it opens in 2021 the 17-story Pavilion will not only be Penn’s biggest and, at \$1.5 billion, most expensive building project to date. It will also be a robust architectural expression of the spirit of innovation, one that could stand as a towering example of the evolution of health-care facility design from art toward science. The Penn team has taken the process of building a cutting-edge hospital as an opportunity to discover along the way how one *should* be designed.

A New Approach and a Nagging Feeling

The last time an inpatient facility was erected from scratch as part of HUP’s network of interconnected buildings at 34th and Spruce Streets in Philadelphia was in the 1990s. At that time, behavioral research was seldom used to inform design. Twenty-five years later, techniques such as mockups and real-life simulations are much more common—though the scale of their use in health care building design is still limited. But when the team charged with building the Pavilion was invited to take risks and think outside the confines of the traditional hospital, a whole new world opened up. (Unlike HUP’s existing inpatient buildings, the Pavilion will be a freestanding structure across the street, adjacent to HUP’s outpatient facility, the Perelman Center for Advanced Medicine, on Civic Center Boulevard; bridges and tunnels will connect the entire complex.)

The first innovation was the mid-2015 creation of the Pavilion’s specially assembled project team, PennFIRST. As an “integrated project delivery” team, PennFIRST brings together staff from the various groups involved in the project



A life-size mockup of an operating room occupies a corner of the full-floor co-location space where the cross-disciplinary PennFIRST team works together to plan for the Pavilion. Pictured are Project Manager Lauren Valentino, Clinical Liaison Kate Newcomb-DeSanto, MSN, RN, MSW, and Senior Project Manager Stephen Greulich.

into a new, unique entity—Penn Medicine employees working together with outside architects and designers from the global health care design firm HDR and international architect Foster+Partners, as well as engineering design and construction management experts from BR+A, L.F. Driscoll, and Balfour Beatty. Now three years into the Pavilion design and construction process, the PennFIRST team of about 100 still occupies a full-floor co-location space in University City. There, moveable walls and tape on the floor are shifted as designs evolve, a screen in the kitchen live streams a view of the Pavilion construction site, and Penn nurses, who are part of the project team, share space with designers and architects. “I wanted everybody to sit around the table like a large Irish Catholic family and talk issues through,” said Kevin Mahoney, executive vice president and chief administrative officer for the University of Pennsylvania Health System. “Everybody had to be together.”

Mahoney, who for two decades has been involved with planning new buildings on nearly every piece of Penn Med-

icine real estate across the region, said he hoped using an integrated project delivery contract would avoid a common pitfall of these projects: bickering among the architect, contractor and owner. With this contract, everyone is at equal risk—or reaps equal reward. If the project comes in under budget, the savings are shared by the architect, contractor, and owner, Mahoney said. If it goes over budget, the penalty is shared, too.

Despite assembling a veritable dream team of health care building designers, Mahoney wasn't happy with the first Pavilion plan. “I was uncomfortable that we were about to spend this much money,” Mahoney said, “and I had this nagging feeling in the pit of my stomach.”

At Mahoney's suggestion, in the fall of 2015, the PennFIRST team rented a warehouse in Philadelphia's Northern Liberties neighborhood and hired union contractors to construct a full-scale styrofoam mockup—the largest in Penn Medicine history—of half an inpatient floor based on that first Pavilion design. “This was about proving out how the



A full-scale mockup of a patient floor (below, left) offered Penn Medicine staff a realistic sense of how they would move and interact in space at the new Pavilion, something not possible with images such as floor plans and renderings (above and below, right).



Photo by Debra B. Foster



building worked,” Greulich said. “We can’t do this halfway and find out in five years there’s a major flaw.”

More than 600 people from all levels of Penn Medicine were bussed to the warehouse for scheduled facilitated tours of the mockup and to give feedback on the design—and the feedback was overwhelmingly positive. “I kept sitting there saying, ‘That doesn’t make any sense to me because I still don’t think it’s right,’” Mahoney said. That’s when he called in a Penn Medicine specialty that had never before been consulted on building design: simulation.

A Simulation Innovation

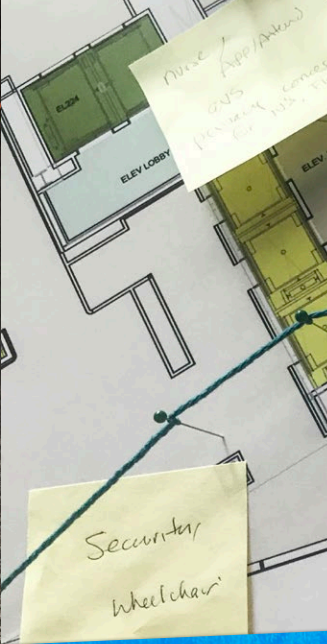
Historically, simulation at Penn Medicine was used for educating staff and assessing competence. The simulation team joined Penn Medicine Academy, the change management, learning and performance improvement focused branch of the human resources department, about four years ago, at the same time a cluster of Ebola virus cases in the United States was prompting hospitals to prepare for

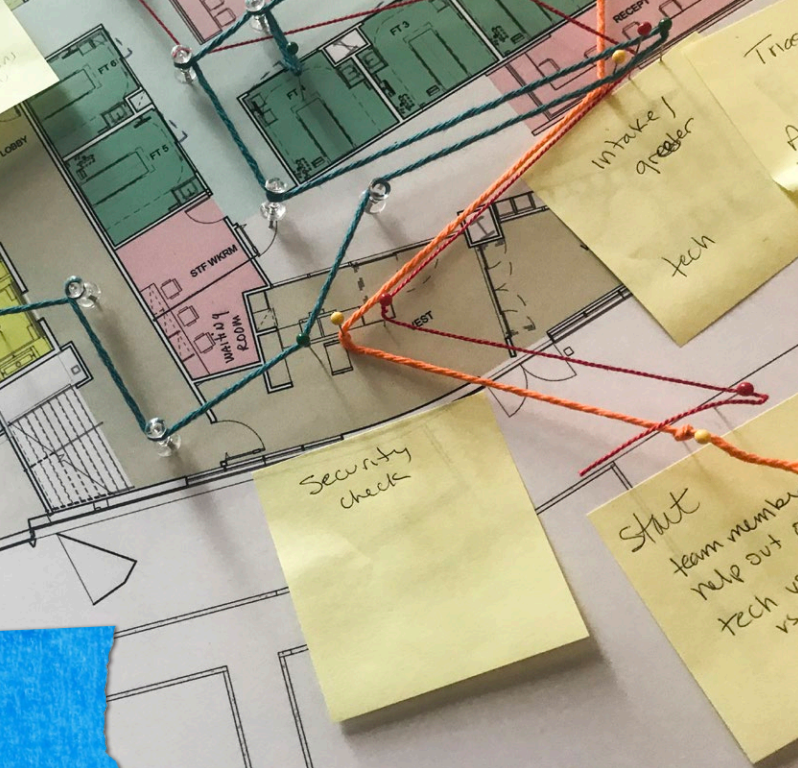
the worst. The Penn Medicine Academy team—shifting from staff training to emergency management—tested Ebola response at three Penn Medicine facilities, evaluating the spaces, teams, and processes, and providing feedback.

Coming off the Ebola simulations just as preliminary work began on the Pavilion, Cindy Morgan, Penn Medicine’s vice president for learning and organizational development, had a breakthrough. Simulation had played a role in how staff learned to use new health system spaces before—most recently, in training for the transition of Penn’s trauma center from HUP to a new facility at Penn Presbyterian Medical Center. Why not use simulation, she thought, in the process of actually developing the facility design for the Pavilion? If future Pavilion employees could interact with the design as realistically as possible, perhaps they could tell the PennFIRST team how the building could work better. “The project has a feeling of being the first of its kind,” Morgan said. “As long as we’re working within the spirit of innovation and trying things that haven’t been



Kathy Gallagher, MS, BSN, RN, NE-BC, a clinical liaison for PennFIRST, pictured at left with Senior Project Manager Stephen Greulich, works with Penn Medicine staff such as teams from security and the Emergency Department (ED) to plan their future operations in the new Pavilion emergency room. Tape on the floor delineates the security check zone at the entrance.





Using pushpins, strings, and sticky notes, ED staff worked with Gallagher to map out the flow of a patient's journey through the department to plan for changes in the new space.

done before, it allowed us to be courageous, to put our toe in the water and say, "We have an idea that we'd like to try." In a meeting with PennFIRST, Morgan volunteered the Penn Medicine Academy team for the Pavilion project. Mahoney, for one, was smitten.

Rather than using simulation to train for infrequent, high-stakes scenarios, like an operating-room fire or patient allergic reaction, simulation at the Pavilion was meant to let clinicians interact in the space as if it were an ordinary day. It took weeks for the simulation team to design the dozens of interweaving—and increasingly complex—workflows to simulate in the mockup over a four-hour period. At the same time, a cohort of about 100 Penn Medicine staff from a variety of clinical service lines, perioperative services, radiology, lab, pharmacy, and all support services were assembled to simulate their jobs in the preview Pavilion.

The first bus of simulation participants pulled up to the warehouse in late December 2015. Bundled in coats, hats and gloves (the mockup had no centralized heating), they took in the maze of white foam with real and fake medical equipment positioned throughout. After an introduction, each participant began acting out a basic workflow specific to his or her typical routine.

The simulations were designed to range from simple workflows to highly complex ones.

A nurse's simplest simulation might begin with their arrival at work—exiting the elevator, putting a lunch in the refrigerator, clocking in—through to collecting assignments for the day, greeting patients, refilling medications, and picking up fresh linens, supplies, or lab testing results. Another simulation workflow for the same nurse might be more complex—consulting with a physician and discussing X-rays with a radiologist, assisting a patient from the bed to the bathroom. By the nurse's final—and most complex—round of simulations, he or she is working with staff from

just about every department. The nurse rounds with an interdisciplinary team in a patient room, while environmental services staff move garbage through the hallways, patient lunches are delivered, and physical therapists work nearby. It's a chance to see how work would be impacted with everything happening simultaneously in the unit.

Lynn Schuchter, MD, chief of the Division of Hematology and Oncology, was among the simulation participants. Though she's been through half a dozen new office spaces and clinics during her time at Penn Medicine, Schuchter said reading floor plans or walking through a single-room mockup were inferior to simulating lifelike workflows. "You experience the space in a very real and different way," she said. "It was real life. People took the exercise seriously." Schuchter said she was staggered by the level of commitment to the simulation process.

As participants pretended their way through the mockup, PennFIRST and Penn Medicine Academy team members were the exercise's eyes and ears. Tasked with collecting observational data from the simulations and producing actionable insights for the PennFIRST team, a performance improvement consultant employed a combination of monitoring methods. Participants were encouraged to think out loud during their simulations, while note-takers recorded what they saw and heard. Facilitators lobbed questions about different aspects of the space. (For instance, did the Pavilion design make it difficult for nurses to keep tabs on their patients?) Stationary GoPro cameras were recording video throughout the mockup (one captured footage of an environmental services employee struggling to move a garbage cart to its designated area), while videographers made the rounds. More data was collected after the simulation sessions through online surveys, focus groups on specific tasks and topics, such as elevators, and debriefing sessions where participants verbalized their thoughts and wrote them on sticky notes.

Getting Back to the Drawing Board

Within about a month, the Phase 1 simulation sessions ended—and the number crunching began. As the Penn Medicine Academy team sifted through some 5,500 comments, they grouped them into common themes. It didn't take long to make perhaps the most striking discovery: Though tour and simulation participants took the same survey on the mockup design, their responses were statistically different. Simulation participants voiced many more negative comments than those who only took the tour, said Gretchen Kolb, director of simulation. "In some spaces, no one had anything nice to say," she said. "The fact that it was so different was really eye opening."

The PennFIRST team pored over the feedback, and set to redesign the building, during an intense six weeks in early 2016, said project manager Lauren Valentino, MHA(c). They emerged with a significantly redesigned inpatient unit, one that fundamentally changed the entire Pavilion. "It was essentially designed from the inside out," Valentino said.



Photo by Debra B. Foster

FINDING FLAWS—IN TIME TO FIX THEM

After more than 600 Penn Medicine employees toured a life-size mockup of half of an inpatient floor of the Pavilion, feedback was overwhelmingly positive.

But when it came to identifying practical flaws in the design, taking a tour was no match for simulating real-world tasks.

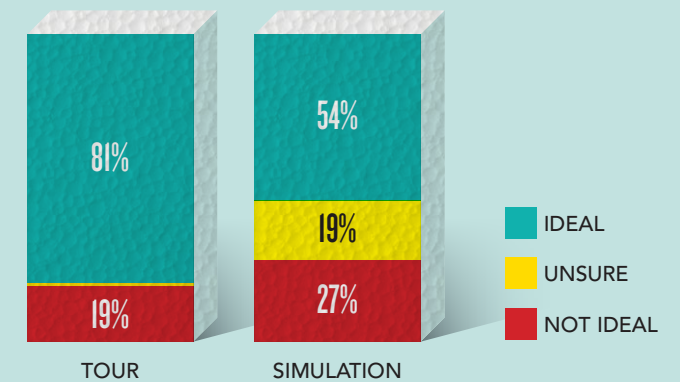
After a tour, most staff rated the patient elevators' location and route to rooms as "ideal."

But after simulating their real work activities in the mockup, barely half thought the patient elevators were ideally situated.

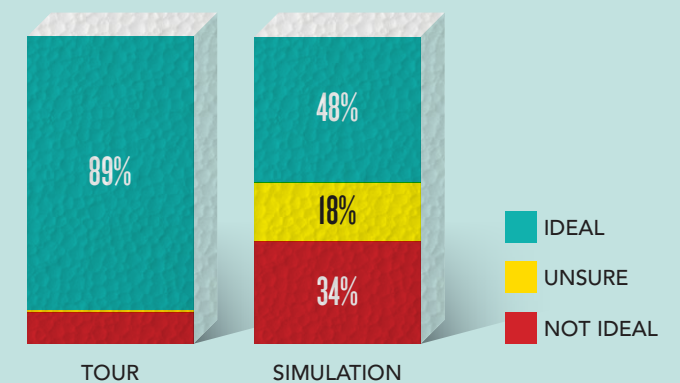
This is just one example of how, in a 30,000-foot life-size mockup of the space, simulation revealed design flaws that a facilitated tour did not. The interactive experience of simulating regular work activities in the mockup yielded more qualitative and quantitative data and identified more opportunities for design modification than a tour alone. Other key themes that required changes included difficulties with the entrance to the unit, location of the patient bathrooms within the patient rooms, clinical support spaces, teaming spaces, unit-specific spaces, isolation rooms and functional needs not previously considered by the design team.

When that feedback was returned to the design team, the entire project team went back to the drawing board.

LOCATION OF PATIENT ELEVATORS



ROUTE OF PATIENT TO THEIR ROOM BASED ON PATIENT ELEVATOR LOCATION



OPEN THE PAGE TO SEE HOW.



NEEDS ASSESSMENT

PLANNING

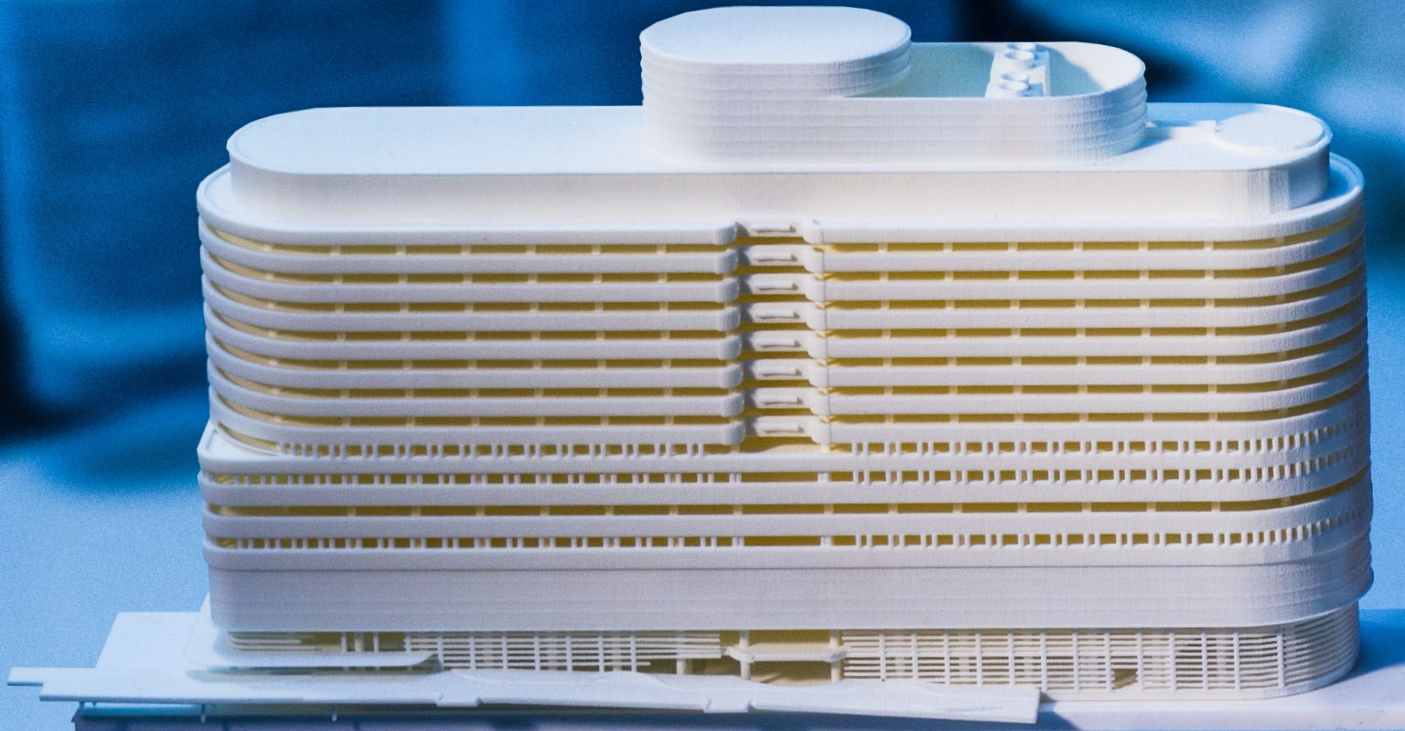
CREATIVE

TOURS OF MOCKUP

FEEDBACK

SIMULATION IN MOCKUP

DESIGN AS OF 2015



FEEDBACK

REDESIGN

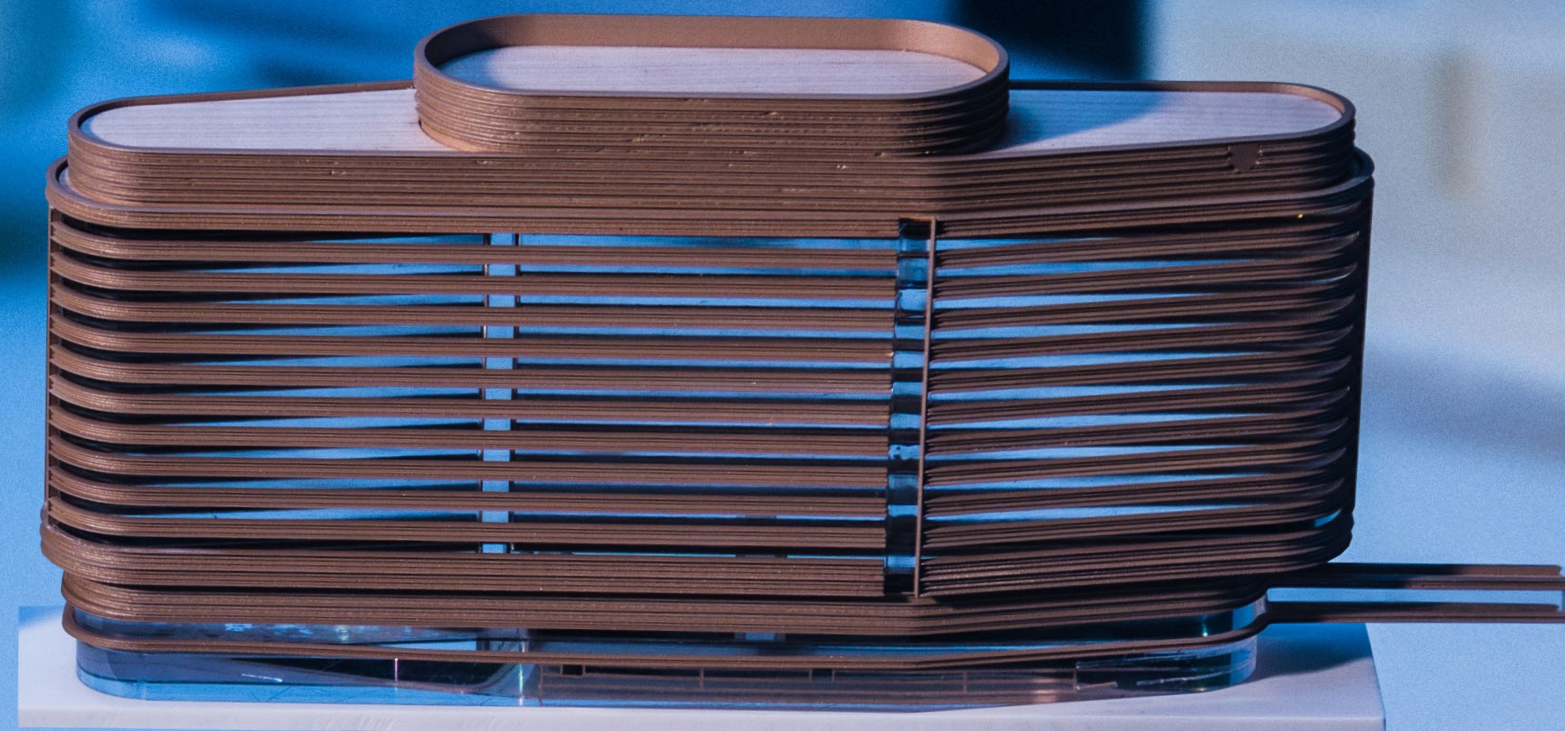
REFINEMENTS

SIMULATION IN MOCKUP

FEEDBACK

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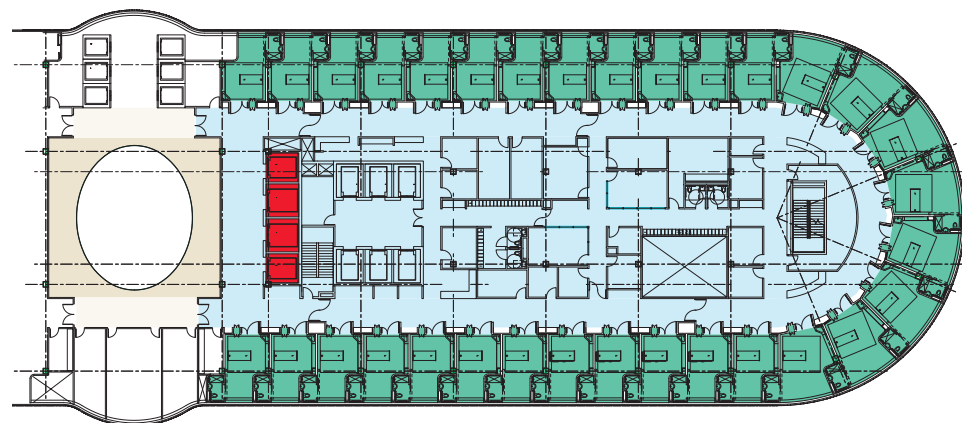
DESIGN AS OF 2016



32-BED INPATIENT UNITS (TWO UNITS PER FLOOR)

PATIENT ELEVATORS AT EITHER SIDE OF CENTRAL ATRIUM

CURVED SHAPE TO SOME PATIENT ROOMS AT ENDS OF BUILDING



The original layout had two 32-bed inpatient units per floor, separated by a common elevator lobby core. After Penn Medicine staff in a variety of roles ran through simulated work activities in the full-scale styrofoam mockup of half a patient floor, they noted problems with the elevator locations. Simulation participants also pointed out that the units were too large for critical care, where demands on staff are higher and the patient-to-staff ratio is lower.

24-BED INPATIENT UNITS (THREE UNITS PER FLOOR)

PATIENT ELEVATORS IN TWO CORES, ONE IN EACH BUILDING WING

ALL PATIENT ROOMS UNIFORM IN SHAPE



Taking all the feedback into account, the design team substantially reconfigured the space. Now, in addition to changes within patient rooms and within the units, each patient floor of the Pavilion has three 24-bed units with two elevator cores. The reconfiguration took a full floor off the building and created an entirely new footprint and exterior shape.



Kevin Mahoney, senior vice president and chief administrative officer for the University of Pennsylvania Health System, has been involved in planning for new Penn Medicine buildings for two decades. He had key roles in deciding to create the integrated PennFIRST team and in suggesting the full-scale mockup of half of an inpatient Pavilion floor.

The first inpatient design already had large patient rooms—all sized for intensive care—and thus “conversion ready,” meaning any room could be adapted for different acuity patients without the expense and hassle of extensive renovations. That fit the PennFIRST team’s overarching mantra for the Pavilion to be “future-proof” or adaptable to changing health care needs and technologies for decades to come. But the arrangement of those rooms was in flux even before the mockup. It became clear during the simulations that having two 32-bed units per floor, separated by a common elevator lobby, would not be adaptable enough; the 32-bed units were too large if all were used for critical care, where demands on staff are higher and the patient-to-staff ratio is lower, said Chris Bormann, architect and director of health for the design firm HDR. The new, post-simulation design included three 24-bed units with two elevator cores, a reconfiguration that took a full floor off the Pavilion and created an entirely new building footprint—an entirely new exterior shape.

One of the biggest interior changes was the location of patient bathrooms, which were originally located on each room’s headwall, closer to the patient’s pillow. During the

simulations, as clinicians mimicked assisting a patient from bed to bathroom, they had difficulty navigating around the equipment next to the bed. As a result, the bathrooms were moved to the footwall.

Those changes were just the beginning. Elevators were centralized. Corridors became easier to navigate and more natural light shone into the building’s clinical areas. Solid walls around offstage support areas were replaced with panes of vision glass to make staff less isolated.

Setting the New Stage

By April 2016, the original warehouse mockup was struck down and rebuilt to reflect the post-simulation revised design. “This is what we all feel is the most remarkable thing: they took our feedback,” Schuchter said. “They valued everybody’s view and they redesigned it.” The revised mockup was ready for a second simulation round with a cohort of 57 people. This time, the reaction was completely flipped. Participants praised the new design with comments like,

“Wow, that was my idea. You changed that because I said there was a problem.”

These new attitudes were also reflected in the data. Though they were asked mostly the same questions as in Phase 1, participants’ feelings about the Pavilion design changed drastically. All told, the second simulation cohort overwhelmingly believed the modified design would provide a positive experience for employees (90 percent), visitors (96 percent) and patients (98 percent). The PennFIRST team was happy, too. Participants still had suggestions on how to further improve the design, but the suggestions required only smaller-scale modifications, not the larger-scale redesign instigated by the first round of simulations. Instead of relocating the elevators, for instance, the team was asked to make them larger.

In the end, the simulations and mockup, which was since demolished and the materials donated or recycled, cost \$785,000. That’s about half a percent of the Pavilion’s \$1.5 billion budget. “The cost we put in paid for itself,” Mahoney said, “because we designed the building a different way.” (After the inpatient floor was dismantled, the mockup and simulations were also repeated with a proposed Pavilion perioperative unit.)

With the overall inpatient design finalized, the PennFIRST team launched into more detail-oriented decisions. At each subsequent step, they are using evidence-based design techniques to lead the way. For instance, they decided on same-handed patient rooms (that is, rooms that are identically oriented, rather than mirror images of each other) throughout the Pavilion based on research that such

HOW TO BUILD DISCOVERY INTO HOSPITAL DESIGN

Not every hospital or medical practice can spend thousands of dollars on mockups and simulations ahead of a building renovation or move. But the team designing the Pavilion had these tips for scaling down their innovative techniques:



ASK FOR OPINIONS: Ask people whose jobs will be impacted by the design change to give their input—and they’ll be more likely to accept the outcome, said Cindy Morgan, Penn Medicine’s vice president for learning and organizational development. “It’s going to make that Day 1 a lot easier,” she said, “even though change is really hard.”



BRING THE TEAM TOGETHER: Talk to your multidisciplinary team all together about what works for them, as you might get different answers in isolation, said Chris Bormann, director of health for the design firm HDR. Also, bringing everyone together at once can reveal more innovative ideas for sharing a space, or expose bottlenecks, redundancy, and waste. “We train as teams, we perform as teams,” Bormann said.



SCALE DOWN: Not every mockup has to be built with 30,000 square feet of foam, said Chris Klock, a Penn Medicine performance improvement consultant. Try using tape on the floor to represent the width of a doorway, and to ensure important equipment will fit through, he said. Or use a blueprint to run through simulation scenarios.



MAKE IT REAL: Any simulations you do should be as realistic as possible, said Stephen Greulich, senior project manager for the Pavilion. “The more you can make it like real life,” he said, “the more people are going to act like it’s real life.”



CHALLENGE THE DESIGN: Remember, no design has to be the final plan, Klock said, especially if it’s not working.

rooms were more efficient for staff and help reduce errors in emergency situations. In the Pavilion, the patient is always on the left, the bathroom is always on the right and the supplies are always in the same place. Similarly, evidence-based design was used in the decision to forego a centralized caregiver station in exchange for multispecialty collaboration spaces and nurse workstations located closer to patients just outside their rooms with windows for observation.

A Design to Shape Experience—for Everyone

As the simulations focused largely on how Penn Medicine staff would interact with the Pavilion, there was also a parallel effort underway, using human experience mapping, to make the building more accessible and hospitable for a broad range of patients and visitors. Using a demographic database of Penn Medicine patients, a PennFIRST team created several unique “personas,” fictional patients who would visit the Pavilion. One was Lillian, an older African American woman who cared for her grandchildren in a multi-generational West Philadelphia household. Arriving at the Pavilion’s emergency department with chest pains is the beginning of Lillian’s, and her family’s, interaction with the new hospital.

In large workshops at the PennFIRST space, nurses, physicians, radiology technicians, administrators, dietary staff, and former patients imagined the most comfortable ways of moving Lillian and other personas through the Pavilion. What would Lillian’s journey look like? What would her family need while she was in the hospital? How could they get help with parking, or making follow-up appointments or getting prescriptions filled? What aspects of the building’s design would help—or hinder—their experience?

Another group is considering how the Pavilion will affect the feelings of those who work there. Lisa Bellini, MD, GME’94, vice dean for academic affairs, is part of a team endeavoring to include well-being spaces on every floor of the Pavilion—private rooms for programs and services to help clinicians handle stressful moments and avoid burn-out. The spaces are expected to include mothers’ rooms for lactation, places for night-shift workers to sleep and multi-functional rooms for meditation groups and other gatherings. Also part of the plan are general wellness rooms where clinicians can take a timeout after a difficult family meeting or adverse event. “There’s no private place to go to take a step back and decompress,” Bellini said. “These places would really try to address this issue.”

The nature of work itself in the Pavilion is on the planning agenda, too. Through “future state workshops,” the PennFIRST team encourages staff to think about the ways they currently work with the goal of creating best practices. A bonus: some groups identified practices they could implement immediately, Valentino said.

The Pavilion will also be a training ground for the next generation of Perelman School of Medicine students, said J. Larry Jameson, MD, PhD, the school’s dean and executive

vice president of the University for the health system. While gaining knowledge, medical students are also learning attributes of clinical care, he said, and in the new Pavilion will watch teams deliver high-quality care in a building designed for that purpose. “We’re transferring more than just knowledge and technical skills to the students,” he said. “The learners will be practicing the future of medicine from the very beginning based on this design.”

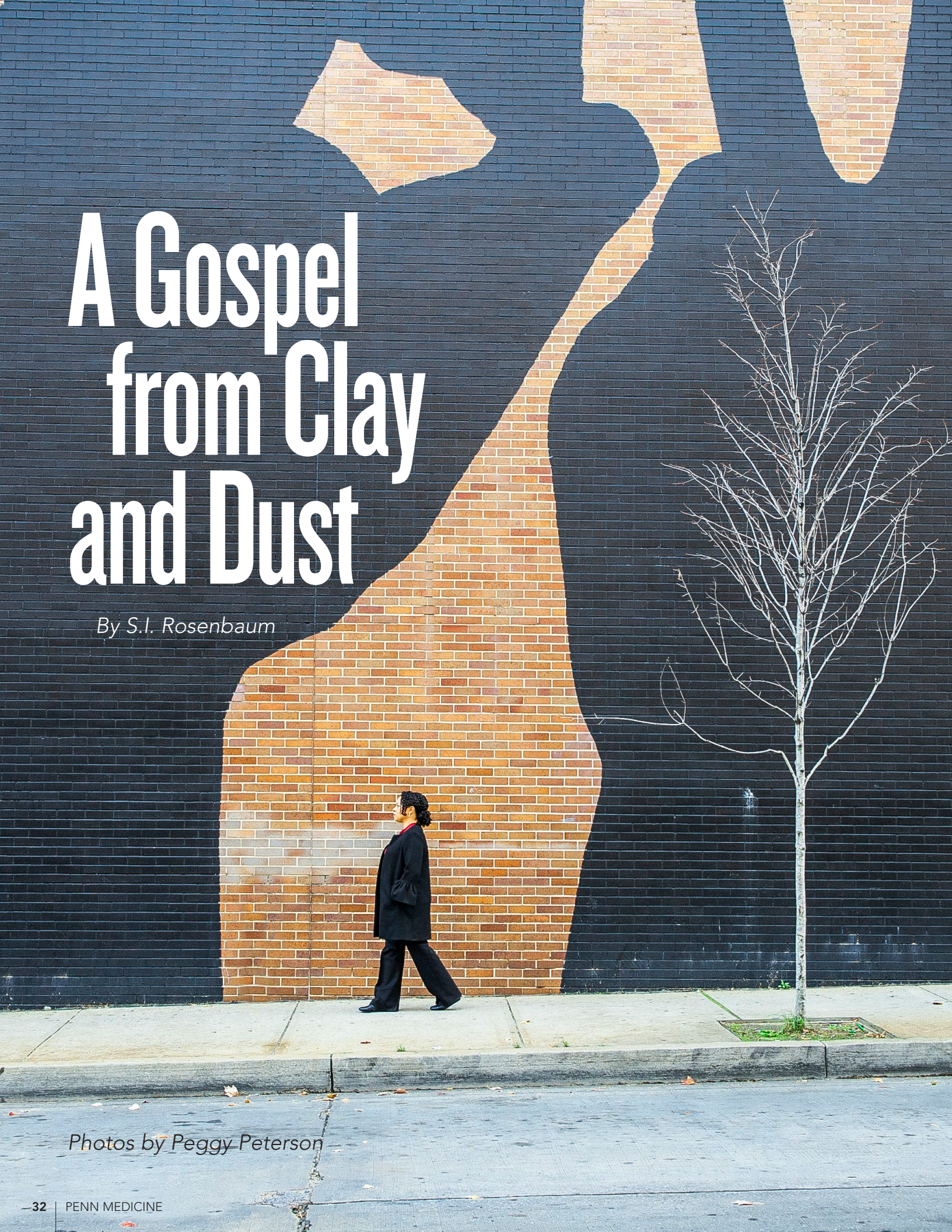
With about three years of Pavilion work completed—and another three to go—there’s still much work to be done before the hospital is fully constructed and occupied. The simulation team is expecting to play a role in the Pavilion transition, helping onboard employees to the space and orienting providers to their new workflows. In the meantime, the team is taking their success at the Pavilion to other outposts of Penn Medicine, including emergency preparedness and rapid response simulations at Penn Medicine Cherry Hill, and helping to inform the design of the new spine center at Pennsylvania Hospital. “The proof of concept was a positive one,” Morgan said. “I think there will be a willingness to use simulation moving forward.”

Meanwhile, PennFIRST team members are sharing their learning from the Pavilion project beyond Penn Medicine by speaking at conferences across the country about their innovative work, Mahoney said. “As a university, part of our role is to disseminate knowledge,” he said.

The team also continues to work as an integrated unit, innovating along the way. Because of the integrated project delivery contract, Bormann said, HDR still has about 30 employees involved in the Pavilion helping to save money and assisting with minor redesigns. And the PennFIRST team continues to run focus groups with Penn Medicine employees to nail down more specifics of the Pavilion design, such as room adjacencies and in-room outlets and utilities. There are full-scale mockups of a patient room, operating room, and emergency department bay in their Market Street co-location space; these continue to serve as a venue for additional prototyping and testing. The team will later add real furniture and design finishes under consideration to gather feedback on selections. As Valentino put it, “I don’t think users will ever not be part of the process.” The opportunity to discover, from real people’s behavior, how to design for the way they work best, is too important to pass up.

“We see this new Pavilion as both a reflection of all the things we’ve been doing well over the last 10 to 15 years and a statement of where we’re going to be in the next 100 years,” said Ralph Muller, CEO of the University of Pennsylvania Health System. “It’s a capstone in the building we’ve been doing here in terms of providing new patient care space, new translational medicine space, new space for our medical students and now a new hospital that’s going to be state of the art worldwide.” □

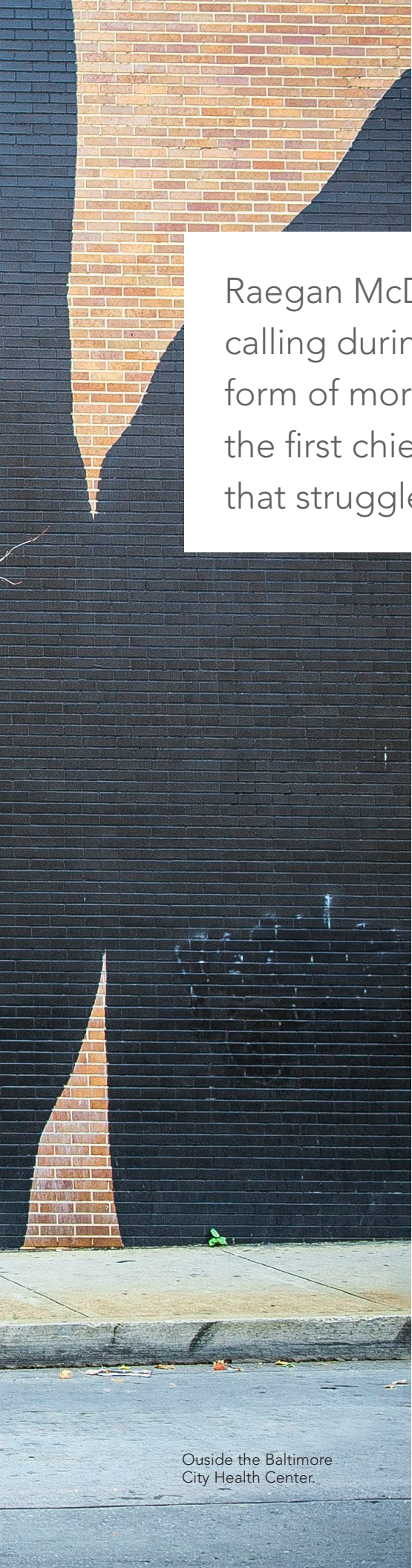
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A Gospel from Clay and Dust

By S.I. Rosenbaum

Photos by Peggy Peterson



Raegan McDonald-Mosley, MD'04, MPH, found her calling during medical school to fight a “needless form of mortality” facing women. During her time as the first chief medical officer of Planned Parenthood, that struggle put her in the national spotlight.

Raegan McDonald-Mosley, MD'04, MPH, closes her eyes and prays.

God, she thinks, as she does on every day she spends in the clinic: God, please let me adequately support these women. Let them all do well and go home healthy in mind, body, and spirit.

She opens her eyes. It's 6:45 a.m., her last moment of calm before she heads to the Planned Parenthood health center in Baltimore. All the patients she will encounter today, including those who have come to the center for abortions, come to her at a crucial point in their own stories, and while McDonald-Mosley may never know their whole story, she'll observe each woman closely to see how she can best serve her. Some of them will need her warmth, her compassion; others will merely need her professionalism. In rare cases, when the occasion is just right, she has been known to sing to them.

This is the part of her work she looks forward to most: the place she gets to do what she knows best, to help people most directly. She has had many days like this when she has needed to stop what she's doing, duck into a counseling room and hold a press conference by phone with journalists all over the country. It was a day like this when the Trump administration moved to strike the birth control mandate from the

Affordable Care Act. McDonald Mosley is more than just a doctor—she was the first person to serve as chief medical officer of Planned Parenthood Federation of America (PPFA), a role that made her one of its primary spokespeople at a time when Planned Parenthood has been fighting for its life.

“I recognize that abortion is a real polarizing issue,” she said. “Yet I feel that anyone who has lived my life, and had the experiences I have had, would see the issue the same way I see it.”

To understand what powers McDonald-Mosley, what shapes her, you have to know about a dusty basement in Tanzania. You have to know about a rural church in Massachusetts. And you have to know about an unspeakable crime committed in the red clay country of North Carolina, in the days of Jim Crow.

Blank Spaces

When Raegan McDonald was born, the nurses who filled out her birth certificate left the space marked “race”



Raegan McDonald-Mosley with her husband, Damian Mosley, at her medical school graduation

blank—they could see that her mother was black, but weren’t sure what to make of her father’s light skin and blue eyes. Among the nine children in the blended McDonald family, baby Raegan was the lightest. Her sisters used to tease her, telling her that she was adopted, that she was really Italian, that she wasn’t really black.

It was enough to make her want to overcompensate a little. “Subconsciously, I dress ethnically and gravitate to an Afrocentric aesthetic,” McDonald-Mosley said.

So in college, at the University of North Carolina at Chapel Hill—not that far from her father’s birthplace—she grew out her hair, styled it into locs, and became an African Studies major. And in 1999, her senior year, she was off to do a research project in Moshi, Tanzania, the first of two trips she would make to Africa as a young woman.

Her research project was to find out what was killing pregnant women at the Kilimanjaro Christian Medical Center. It was one of only two hospitals in the area that kept records, and they kept them in the basement. It was hot down there, and dusty. She spent hours there poring over documents, reading reports. She’d thought, going in, that the pregnant women were probably dying of AIDS complications, or lack of transfusions, or hypertension. It was none of those things.

In Tanzania, abortion is punishable by up to 14 years in prison. And again and again, the reports told her, dying women came to the hospital after attempting to abort a pregnancy by themselves or with help from healers. It was the leading cause of death for pregnant women.

At times, the heat grew too much and the dust irritated her eyes and nose. One of these times, she wandered up from the basement to take a break. The hospital’s wards were open, and she saw a woman who looked very sick. Internal bleeding, multiple organ failure, the doctors told her. The woman couldn’t care for another child, so she’d gone to a healer.

“You can imagine this dichotomy of experience, where I’m poring over these

hospital records, reading these stories of women who come in near death, the severe morbidity related to unsafe abortion,” McDonald-Mosley said, remembering. “Then I pivot to being on the ward and actually seeing it.”

As a kid, her parents had thought she might become a minister. In college, she’d leaned toward becoming an academic. Instead, when she came home from Tanzania, she was on a different path.

When she returned to Africa, it was as a medical student at the University of Pennsylvania. This time she traveled with a young culinary student, Damian Mosley, who would soon become her husband. While he studied West African cuisine, she worked in a hospital in Dakar. In Senegal, abortion is legal but highly restricted, and once again Raegan McDonald saw women who had been horribly injured by amateur procedures. One had a punctured colon, but swore she hadn’t tried to abort the pregnancy. To admit so much would be to admit to a crime.

At night, after her shift, she would tell her fiancé about the women she was treating in the hospital. He was a good listener. It was something she loved about him.

She didn’t tell him then, but she was becoming surer and surer that this was her calling—her ministry, as her mother would put it years later—to fight what seemed like a “needless form of mortality” for women.

“I would dedicate my life to reducing that in any capacity I could,” she said.

Path to a Calling

The idea of having a calling—of being used for a purpose by something bigger than herself—was something she’d learned at Calvary Baptist Church in Haverhill, Massachusetts.

The church has a domed white ceiling held aloft by honey-colored wooden beams. It’s a place where folks lay on hands; a place where they sing. Growing up, whenever McDonald-Mosley and her sisters weren’t traipsing through her family’s three-acre patch of woods, they were here: Wednesdays for Bible study, Saturdays for choir prac-



Seen here with nurses and staff from the maternity ward at the Grand Yoff Hospital in Dakar, Senegal, McDonald-Mosley found her experience there drew her toward her calling to work in women's reproductive health.

tice. This is where McDonald-Mosley first deployed the mezzo-soprano that would someday soothe her patients. "I lived at church," she said.

Out of her sisters, she was the one who seemed most interested in the Bible and the lessons it described. "Her father and I thought she was going to go into ministry," recalled her mother, Miriam McDonald. "She always had a penchant for the underdog or making

sure the right thing was done, that people were properly represented. That was part of her DNA."

Church was where McDonald-Mosley learned to think in terms of justice. She didn't hear all that much about the wages of sin from the pulpit there, she said. Instead, in the tradition of African-American church activism, it was, "How do we fill the needs of community, how do we get food to people who are

hungry, how do we enrich our youth so people get on the right track and go to college?"

After graduating from medical school at Penn in 2004 and completing a residency in obstetrics and gynecology at New York University Medical Center—and having two children— McDonald-Mosley took a fellowship at Johns Hopkins University School of Medicine and earned a master's of public health at the Bloomberg School of Public Health. She still thought she might end up as a teacher. But when Planned Parenthood of Maryland asked her to be their medical director, she saw a greater opportunity.

"Where else can you work where, regardless of whether the patient has insurance, it doesn't matter—we're here to take care of them and give

them what they need, no matter what?” she said. “It was a way to be a physician and also be a justice advocate.”

She didn’t talk about her new job much when she went home to Calvary Baptist, though. “I think I was a little worried they would judge me, even though I didn’t hear any anti-abortion rhetoric there,” she said. In the end, neither her family in Christ nor by blood took her to task—except for one.

“I did have one cousin who said to me—and this really stung—‘It made sense when you became an OB/GYN, because you’re so compassionate and care about women and babies. But it doesn’t make sense to me you’d specifi-

“She was always helping us, guiding us,” said another clinician, Sharon Reith. “She makes you feel like you’re the only person in the world when she’s talking to you.”

There were other initiatives she was proud of, too—like making it easier for patients to access long-term birth control, and making sure all women who came to the centers for abortions got access to birth control as a matter of routine. Before, these patients weren’t offered long-term birth control methods before leaving the clinic; now, McDonald-Mosley made sure they could get an IUD the same day, if they wanted, at any Planned Parenthood

“Raegan manages to combine the first-hand experience of delivering care to our patients every week in Baltimore while working to address the most important health care delivery issues across the country.”

-Cecile Richards

cally [perform abortions]’. That didn’t go along with her view of how she saw me, as a super empathetic loving person,” she said.

“I wish I’d had the clarity of mind to say to her, in that moment: That’s exactly why I’m so interested in this work. That’s exactly why I do this work.”

She worried at first that she would miss teaching. But it turned out there was plenty of teaching to do. As medical director, McDonald-Mosley instituted regular Skype training sessions with clinicians at Planned Parenthood clinics all over the state, so they could coordinate their standards of care. She also loved working with midwives, nurse practitioners, and young doctors. “Every time I had a question, she had an answer,” said Gretchen Nettle, a Planned Parenthood clinician who became one of McDonald-Mosley’s many protégés. “And she never makes me feel less for not knowing the answer or needing an answer.”

clinic in the state. “The patients were so grateful,” she recalled.

Still, after five years, when the position of chief medical officer for the national Planned Parenthood organization was created, McDonald-Mosley didn’t think at first that she should apply. The listing asked for ten years of experience, which was more than she had. “When they invited me to apply, I didn’t think I was going to be a top candidate or a serious candidate,” she recalled. “But the more I learned about the position, the more I realized it was doing what I was doing at Planned Parenthood of Maryland—but on a national scope.”

The position was a new one, designed as a spokesperson who could draw on a knowledge of both hands-on clinical experience and a familiarity with women’s-health policy and best practices. In a way it was tailor-made for her. Besides, it was 2014, and the organization was in an optimistic mood: Abortions



At the Baltimore City Health Center, McDonald-Mosley (pictured with Cecilia Pineada) continued to see patients one day per week while taking on a public-facing leadership role as PPFA’s chief medical officer.

and teen pregnancies were down nationwide, health care had just become universal, Obama was in the White House. “It seemed like the tide was turning,” McDonald-Mosley said, “that we could move toward more access and innovation and decreasing inequity. The



ACA had been in place a couple of years, we were making good progress. It seemed like this is a good opportunity to jump on board and be part of something really positive.”

When they offered her the job, she took it.

Turn of the Political Tide

On July 14, 2015, McDonald-Mosley had just dropped her kids off with their grandmother in Massachusetts and was driving back to Baltimore when

her cell phone buzzed. She ignored it. It buzzed again. And again.

“My phone was just blowing up,” she said.

A group of anti-abortion activists, posing as a medical research supply company, had managed to film a meeting with a Planned Parenthood executive. The footage they released—Planned Parenthood officials say it was heavily edited—showed a physician appearing to discuss the sale of organs from aborted fetuses. In reality, the doctor was dis-

cussing how much it cost to process and transport fetal tissue that patients have donated to scientific research; Planned Parenthood says it makes no profit from these donations. But for many viewers, the footage would seem damning.

As she watched the video, McDonald-Mosley felt her stomach drop. She had been chief medical officer for exactly 14 days.

At that moment, she said, “I knew everything was going to be different.”

The response was immediate: Conservative politicians called for investigations of Planned Parenthood and talked about possibly defunding the organization. Donald Trump—who had recently announced his run for president, but wasn't yet considered a serious candidate—quickly worked the video into his talking points. “I mean these people, what they say and the way they, it's like you are selling parts to an automobile or something,” he told conservative radio host Laura Ingraham not long after the video's debut.

McDonald-Mosley led the briefing team, but in the weeks and months to come strove to balance the video's negative message with a positive one on many aspects of sexuality, speaking to outlets such as *Cosmopolitan*, *Glamour* and *Teen Vogue* about how to use condoms or overcome obstacles to sexual pleasure. She had become a public face of Planned Parenthood. It was a time she recalls as “traumatic,” and her husband remembers her being “under tremendous stress and a tremendous burden,” to a degree he hadn't seen since

she was pregnant during her medical residency.

Others at the organization were unaware of her private doubts. “All I could tell from the outside was that it was pretty amazing that she was able to join and jump in and handle what was obviously a difficult situation,” said Julia Kohn, Planned Parenthood's national director of research. “I think she maintains a calm presence, and even in the face of adversity she really understands the importance of speaking to audiences in a way they can hear it.”



In Baltimore, McDonald-Mosley had worked closely with the city government and state health department. It was a liberal city and state, and she had felt valued by the community. Now, on the national field, that was no longer true.

The election of Donald Trump and an all-GOP legislature in 2016 next took the country, and the organization, by surprise. In the year that followed, a series of legislative and regulatory moves changed the backdrop for their work. Across the country, numerous movements emerged in state legislatures and the federal government to restrict access to both abortion and birth control. The Trump administration loosened the interpretation of Obamacare requirements mandating all health insurance include contraception coverage without a co-pay, so it is now easier for employers to deny this coverage to employees. Each narrowly defeated attempt to “repeal and replace” the Affordable Care Act has included a measure to block Planned Parenthood from receiving government funding for non-abortion health care to low-income patients in the form of Medicaid reimbursements and Title X federal grants for family planning services.

“I have lots of moments of personal doubt,” McDonald-Mosley said in an interview in September 2017. “I’ve really been stressed in the last two years, and wondered if I’m the right person to do this job. But I never have doubt in the movement or organization.”

That month, the Lasker Foundation honored Planned Parenthood with the Lasker-Bloomberg Public Service Award, a selection noted by the *New York Times* as an entry into “more political territory” than usual for the humanitarian and scientifically focused prize. The foundation cited Planned Parenthood’s provision of essential health services, including comprehensive reproductive health care, for more than a century, serving 2.5 million people just in 2015.

In her work as the organization’s chief medical officer, McDonald-Mosley continued to issue statements, go on TV, write op-eds, and see patients. She

appeared on the *Daily Show* and published perspectives in the *New York Times*. She talked about everything from her personal experiences learning about sex from her mother, who had been a teenage parent, to the vital role of Planned Parenthood’s preventive care services, such as cancer screenings. It would be daunting for anyone, but people who know McDonald-Mosley say she’s relentlessly dedicated. “Raegan manages to combine the first-hand experience of delivering care to our patients every week in Baltimore while working to address the most important health care delivery issues across the country,” said PPFA President Cecile Richards. “Her commitment as a health care provider and her passion for our movement have made her a heroine to patients, colleagues, and women everywhere.”

In December 2017, McDonald-Mosley reassessed her position and the hardship caused by travel that brought her from Baltimore to New York and Washington over the span of every week. She stepped back to her previous role as medical director of Planned Parenthood of Maryland, where she remains committed to her patients, to her calling to provide the care her patients need.

Born with this History

When people ask her to justify her work, McDonald-Mosley often reaches back to her experiences as a college and medical student in Tanzania and Senegal. “I provide abortions because I have seen firsthand the devastating consequences for people who do not have access to safe, legal abortion by trained providers.” That’s a quote from her in an official Planned Parenthood tweet.

But there’s more to it than that. There is a story McDonald-Mosley doesn’t remember being told; she pieced it together, she says, from murmurings in her family as she was growing up. The story goes like this:

In 1936, a girl was raped in the red clay farming country outside Charlotte, North Carolina.

She was black. The man who assaulted her was white, and he owned

the land her family farmed. Abortion was completely illegal then, not just in North Carolina but everywhere, and there was no question of pressing charges in the Jim Crow South. So nine months later, the girl gave birth to a boy she named Robert. She was not yet 14.

She raised him as best she could until he was about 7, when she gave him up to foster care. It didn’t stick. He kept running away, running back to the woman who birthed him, until he was old enough to join the Navy. Robert McDonald told his recruiter that he was white so that he could learn a skill while he was in the Navy. He was light enough to pass.

He served in Korea, and afterwards he eventually wound up in Boston, where he hung around in jazz clubs and met the beautiful daughter of a jazz pianist. Her name was Miriam. They named their youngest Raegan.

“I don’t think she’s ever far removed from remembering how she got here,” said Damian Mosley, the man that child would later marry. “The burden she carries, it’s a burden connected to where you come from; it’s a burden that’s connected to freedom and ideas of freedom, and I think that’s something that maybe not every single one, but most black people in America have some experience of.”

“It’s hard, as a person whose literal existence comes out of a history of racism and violence, for me not to think about it all the time,” McDonald-Mosley said. “My literal DNA, my self.” Her own experiences are inextricable from the history that came before her. If she hadn’t been teased by her siblings for inheriting her father’s light skin, would she have insisted so hard on claiming an Afrocentric identity, gone to Tanzania? To Senegal? Would she have seen what she saw, become the person she became?

“I am who I am,” she said. “I was born with this history. All I can do is make something constructive of all of it.” □

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OUR FRIENDS IN FLORIDA GET AN INSIDER'S LOOK AT PENN MEDICINE'S LATEST ADVANCES

"Cellicon Valley" Comes to the Sunshine State

Escaping the chaos of the Philadelphia winter, leading physicians and researchers from Penn Medicine offered guests in sunny Palm Beach and Naples an insider's view of the next great medical innovations.

"Penn and the city of Philadelphia have long traditions of innovation, so there should be little surprise that we're being recognized a national leader in research, start-ups, and commercialization," noted Dean J. Larry Jameson, MD, PhD.

"And Penn Medicine wouldn't be the powerhouse it is today without the combined strengths of our champion faculty and dedicated philanthropic partners," said Ralph Muller, CEO of the University of Pennsylvania Health System. "Being able to share knowledge that helps promote a healthier and well-informed public—it's a big reason why we love to visit our friends in Florida each year."



"The warmth and spirit of events like these represent the best of what the Penn Medicine community stands for, and it is always gratifying to showcase the unparalleled depth and breadth of expertise from our outstanding faculty," said Dean J. Larry Jameson, MD, PhD.

Penn Cardiovascular Institute Director Dan Kelly, MD, brings a unique perspective to research with his expertise in diabetic heart disease.



Wilson Szeto, MD, a pioneer in the rapidly evolving field of transcatheter cardiovascular surgery, talked to guests in Naples about new techniques on the horizon.



Thank You to Our Penn Medicine in Naples Host Committee!

- Patty & Jay Baker
- Jacqueline & Arturo Balandra, MD
- Mary & John G. Brehm, MD
- Dottie & David Brennan
- Julie & James Guerra, MD
- Fern Feinberg & Jeffrey M. Hoffman, MD
- Graceann & Jack Hoopes
- Denise Brown & G. David Hopper, MD
- Barbara V. Howard, PhD & William "Jim" Howard, MD
- Kimberly & Robert Klausner, MD
- Susan & Jim Shea
- Lynn Burke & Steve Taub
- Rhoda & Gene Temkin
- Joseph R. Zebrowitz, MD

"Immunotherapy is the 'overnight success' that was more than 20 years in the making, and it was early investments from Penn Medicine and our donor community that has helped Philadelphia emerge as the biomedical 'Cellicon Valley,'" said Robert Vonderheide, MD, DPhil, the John H. Glick, MD Abramson Cancer Center Director's Professor and director of the Abramson Cancer Center.



"Addiction is one of the most significant and complex problems facing medicine today," said Caryn Lerman, PhD, the John H. Glick, MD Professor in Cancer Research and vice dean for strategic initiatives. "The history and breadth of our expertise means we're making an impact at the personal and public health level."



Chief Scientific Officer Jonathan Epstein, MD, led an all-star panel of cancer researchers who expanded on the promise of immunotherapy—and the new early detection and treatment approaches to come.



"Everyone knows that the brain is complicated and that any mental illness, such as addiction, is difficult to cure—so how can we prevent it?" Chair of Neuroscience and David J. Mahoney Professor of Neurological Sciences John Dani, PhD, discussed his work discovering the molecular basis of nicotine addiction and what forces can shape the brain.

BY THE NUMBERS

"Living Better – 2018" Seminar



Dean's dinner at The Breakers in Palm Beach



Penn Medicine in Naples



From PHL to Palm Beach



From PHL to Naples



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1980s

Paul A. Rusonis, MD'82, is medical director of a recently opened dermatology and advanced skin care practice in Ellicott City, Md., with Integrated Dermatology. He continues to lead a medical team of five. Rusonis is a board-certified dermatologist and a member of the American Academy of Dermatology, American Society for Dermatologic Surgery, and the Maryland Dermatologic Society.

Frederick L. Jones III, BA'79, MD'83, MBA'00, was named partner at BioAdvance, early-stage life sciences fund, after it added six new companies to its portfolio. Most recently, Jones was a director with Broadview Ventures, founder of Spordiff Therapeutics, and CEO of Anchor Therapeutics. Early in his career, Jones practiced internal medicine, most recently as an assistant professor in the University of Pennsylvania Health System.

Gene Z. Salkind, MD, BA'74, GME'85, joined the advisory board of CURE Pharmaceutical, a drug delivery and development company. Salkind will provide strategic counsel to the company's clinical trials and partnerships for the CUREfilm technology for the central nervous system and other therapeutic areas.

1990s

Bernard J. Costello, DMD'94, MD'97, GD'00, GME'00, has been named dean of the University of Pittsburgh School of Dental Medicine. Costello served as interim dean since February 2018 and began his deanship on April 1. Costello is chief of both the Division of Craniofacial and Cleft

Surgery in the School of Dental Medicine and the Division of Pediatric Oral and Maxillofacial Surgery at Children's Hospital of Pittsburgh of UPMC. Costello is currently the president-elect of the American Cleft Palate-Craniofacial Association.

2000s

Anthony Y. Sun, MD, GME'00, MBA'02, has been appointed as an independent member of the board of directors for Eyenovia, Inc. Eyenovia is a clinical-stage biopharmaceutical company developing a pipeline of ophthalmology products that utilize its patented piezo-print technology to deliver micro-therapeutics topically to the eye. Sun trained in Internal Medicine at the Hospital of the University of Pennsylvania.

Joseph Henry Hedrick, MD'05, a specialist in general and trauma surgery, has joined the Mohawk Valley Health System Surgical Group – Faxton Campus and has privileges at Faxton St. Luke's Healthcare and St. Elizabeth Medical Center.

Marcela V. Maus, PhD'03, MD'05, GME'08, was appointed to the scientific advisory board of Torque, an immuno-oncology company. Maus is an assistant professor of Medicine at Harvard Medical School and director of Cellular Immunotherapy at the Cancer Center of Massachusetts General Hospital. Previously, she was an assistant professor and director of Translational Medicine and Early Clinical Development in the Translational Research Program at the University of Pennsylvania.

Ali Behbahani, MD'07, MBA'07, has joined the board of directors for Genocea Biosciences, Inc., a biopharmaceutical company developing neoantigen cancer vaccines. Behbahani is a partner in the health care group at New Enterprise Associates, where he specializes in investments in the biopharmaceutical, medical device, specialty pharmaceutical, and healthcare services sectors.

2010s

Bat-Sheva Maslow, MD, GME'13, is a reproductive endocrinologist at Extend Fertility Medical Practice, a specialty egg-freezing practice in Manhattan. Previously, Maslow was an associate physician at a private infertility practice, Gold Coast IVF, in Long Island, where she treated women and couples with a wide range of medical and surgical issues.

OBITUARIES

1940s

George Manstein, BA'37, MD'41, GME'48, a plastic surgeon; Dec. 2. After serving as an anesthesiologist in the U.S. Army's medical corps during World War II, Manstein returned to Penn to study surgery. He joined Philadelphia's Einstein Medical Center in 1956 and chaired the department for more than 20 years. He traveled to Israel in the weeks following the Six Day War of 1967 to treat the injured, and was the first non-Israeli member of Israel's professional society for plastic surgeons.

Shirley G. Driscoll, BA'45, MD'49, a retired pathologist; Jan 1. A professor emeritus of Pathology at Harvard Medical School, Driscoll was appointed chief of Pathology at the Boston Hospital for Women, Lying-in Division, in 1978, and served as director of Women's and Perinatal Pathology at Brigham and Women's Hospital until her 1993 retirement. She was internationally recognized in the field of placental, perinatal, and reproductive pathology. Driscoll was a pioneer in uncovering the pathology associated with infants of diabetic mothers, and made significant contributions to the understanding of fetal disease, inherited disorders, and diseases of the placenta.

1950s

Eugene A. "Pat" Hildreth, MD, GME'54, an internal medicine

physician; Jan. 5. After serving in the Navy/CIA in Asia from 1951-1953, where he was the chief medical officer of a M.A.S.H. unit, Hildreth worked at HUP as a professor of Clinical Medicine, the head of Allergy and Immunology, and special advisor to the dean. He went on to become the director of the Department of Medicine at the Reading Hospital and Medical Center from 1968-1996 while continuing to maintain an active medical practice. He served as chairman of the American Board of Internal Medicine, the chairman of the Federated Council of Internal Medicine, and chairman of the board and later president of the American College of Physicians. Hildreth was elected to the Council of the Institute of Medicine of National Academy of Science, a Fellow of the Royal College of Physicians (London), and an Honorary Fellow of the Academy of Medicine (Singapore).

Dennis A. Sharkey, MD'54, a retired pathologist; Dec. 20. At 18, he enlisted in the U.S. Army Air Corps and served overseas, receiving multiple awards for his service. After training in pathology at the VA Hospital at the University of Pittsburgh, he was appointed as a board certified chief of Pathology Services at the former Andrew Kaul Memorial Hospital in St. Marys, PA and the Elk County General Hospital in Ridgway. He was President of Medical – Dental staff at Andrew Kaul Memorial in 1989-1991 and 1993-94.

Luis Schut, MD, GME'57, emeritus professor of Pediatrics; Jan. 31. Schut was chief of Neurosurgery at the Children's Hospital of Philadelphia for more than 25 years and an emeritus professor of Pediatrics and Neurosurgery at the University of Pennsylvania. He came to the United States in 1955 and, after a rotating internship and one-year period of training as a psychiatric resident, he was accepted for neurosurgical residency at HUP. Following a period of training in neurosurgery at the Great Ormond Street Hospital in London, he returned to Penn in 1962. In 1969 he was appointed chief of Neurosurgery

at CHOP where he remained until his retirement in 1996.

Harris “Bubs” Meisel, MD’59, a rehabilitation specialist; Feb. 23. After serving in the U.S. Public Health Service followed by training as chief resident in Rehabilitation Medicine at Stanford University Hospital, Meisel developed a physical medicine and rehabilitation hospital on the grounds of the former Santa Barbara County Hospital. He was considered the founder of rehabilitation medicine on the Central Coast of California, and was medical director of what is now the Cottage Rehabilitation Hospital. He enlisted forces under the Americans with Disability Act to outfit and revamp Santa Barbara’s public buildings and spaces for universal, disability-inclusive use.

1960s

Roger E. Farber, MD’63, GME’69, a neurologist; Jan. 24. Farber served in the public health service at NIH, and completed his residency in Neurology at Penn. Farber co-founded the Noran Neurological Clinic in Minneapolis, Minn. He was at the vanguard in using L-Dopa to treat Parkinson’s disease and in reversing the worst effects of acute multiple sclerosis and in the use of carotid ultrasonography for stroke prevention. In 1989, he joined the Neurology faculty at Penn. In 1995, he opened his own private practice, the Pennsylvania Headache and Pain Center. His widow is Abigail First Farber, MD’63.

Andrew G. Glass, MD’65, a pediatrician and oncologist; Nov. 16. Born in Warsaw in 1939, Glass and his family immigrated to New York in 1945. Glass earned his undergraduate degree at Harvard and trained in Pediatrics at the Massachusetts General Hospital, then served in the U.S. Public Health Service in Bethesda, Md., before completing a pediatric oncology fellowship at the Sidney Farber Cancer Institute in Boston. Subsequently, Glass spent his entire medical career at Kaiser Permanente North West (KPNW) in Portland, Ore., in Pediatrics, Pediatric Oncology,

Adult Oncology and research. He was the driving force behind the expansion and funding of the KPNW registry, which now contains highly detailed case information, dating back to 1960, and later worked with health officials in India to support the creation of registries there. His own research centered on the effect of post-menopausal hormone replacement therapy on the incidence of breast cancer.

FACULTY

Roger E. Farber, MD. See class of 1963.

Leonard Jarett, MD, longest-serving chair of Pathology and Laboratory Medicine; Jan. 13. Jarett attended the Rice Institute in Houston and received his MD from Washington University in St. Louis, where he went on to complete his residency and additional training, and served as a member of the medical faculty from 1966 until he came to Penn. Jarett assumed the chairmanship of the Pathology Department at Penn in 1980 and in 1985 was named the Simon Flexner Professor and Chair. The department was formally renamed the Department of Pathology and Laboratory Medicine under his leadership, emphasizing the integration of Anatomic Pathology and Laboratory Medicine and reflecting the department’s broader scope. Jarett held the chair’s position until 1998, when he became distinguished professor of Pathology and Laboratory Medicine. He served as vice chairman of the Medical Board at the HUP (1984-1986) and as associate dean for Faculty Affairs (1989-1990). He was internationally recognized as an investigator in the area of insulin action and was deeply committed to developing an integrated department that excelled in clinical service, both basic and applied research, and teaching. A completely redesigned residency program was instituted early in his tenure as chair. In the department, Jarett is remembered as an exceptional mentor to an entire generation of academic pathologists.

Luis Schut, MD. See class of 1957.

LEGACY GIVING

Like Father, Like Son: A Tradition of Service and Compassionate Philanthropy

The Erb family is a prime example of creating hope and healing from loss. William H. Erb, Sr., BA’27, MD’30, GME’34, lost his father to the flu pandemic that swept the globe in 1918. This early tragedy inspired him to study medicine at Penn, leading to a long, distinguished career as head of Penn Services at the Philadelphia General Hospital and the first chief of surgery at Riddle Memorial Hospital.



His son, William H. Erb, Jr., MD’66, GME’73, has proudly followed in his father’s educational, career, and philanthropic footsteps. As a child, he had the opportunity to meet celebrated physicians such as Jonathan Rhoads, long-time chair of Surgery at the Hospital of the University of Pennsylvania. “At Penn, I was thrilled to be learning from the very luminaries that I met earlier in life, and with a father I so admired, I really never considered any career outside of medicine,” William, Jr. said.

The William H. Erb Scholarship Fund celebrates this family’s gratitude to Penn Medicine for launching two successful careers. The late Erb, Sr., established and endowed the Fund for medical students in his will, and Erb, Jr., makes his own gifts to the Erb Fund as a loving testament to his father and expression of his own affection to the medical school that nurtured them both.

“Through words and actions, my parents taught me the importance of philanthropy,” Erb explained, “and I’ve tried to do the same with my children and grandchildren. Giving to the scholarship fund that my father set up—now and in my will—was as easy a decision as choosing Penn’s medical school. It’s just a part of me. And philanthropy is an extension of the world-changing humanism and compassion that drew us to medicine.”

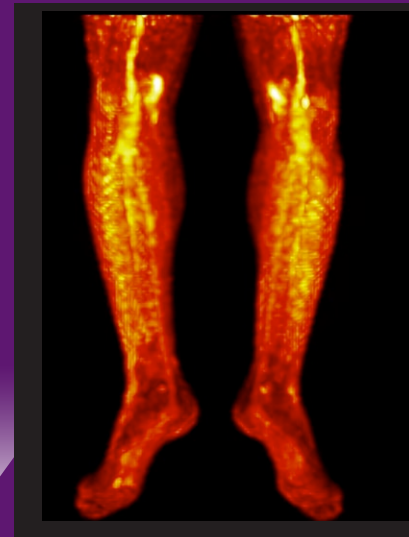
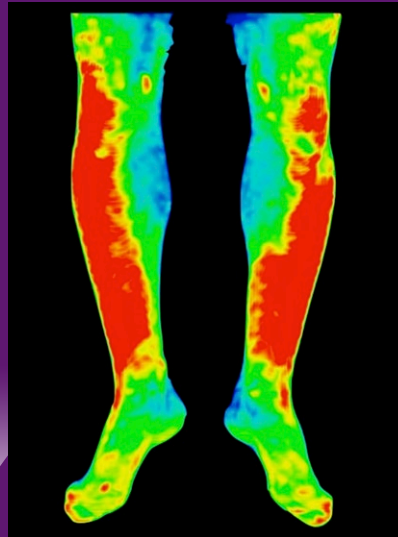
He continued, “My father and I agreed on the obvious need for good doctors, and while we didn’t receive scholarships ourselves, we believe they are essential for helping pave the way for many bright students. I am proud that my family is continuing to play a part in helping the School maintain its tradition of excellence.”

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.plannedgiving.med.upenn.edu

BRINGING PSORIASIS TREATMENT HOME

By John Infanti



More than skin deep: In patients with psoriasis, visible irritation (left) correlates to inflammation seen in scanning PET images of the skin itself (center, greatest inflammation in red) and of the arterial vessels (right).

Research shows minorities are less likely to seek care for the skin disease. Now there's an effort to find out if in-home treatment can better serve patients.

Deadlier cancers. Fewer corrective surgeries for those who survive breast cancer. Higher rates, earlier onset, and faster progression of glaucoma. Specialists in every medical discipline are working to correct the harms of racial disparities in American health care. Still, the more anyone shines a light on those inequities, the grimmer the picture can appear. But in the world of dermatology, the literal act of shining a light—ultraviolet B light, used in phototherapy treatments—could be part of the answer to reducing the treatment gap affecting racial minority patients with psoriasis.

That disparity is more troubling than a mere irritation. There is evidence to indicate that when African Americans get psoriasis—an inflammatory disease that causes raised, red patches of skin covered by silvery scales—their cases tend to be worse than in white patients. Moderate to severe cases of psoriasis carry an increased risk of heart attack, stroke, and premature death, a finding established by Penn Medicine dermatologist Joel M. Gelfand, MD, MSCE'03, in a 2006 landmark study.

Yet a recent Penn study found that a higher percentage of whites saw a dermatologist for their psoriasis than did non-Hispanic minorities, which include blacks, Asians, native Hawaiians and Pacific Islanders, and others, an average of 50.8 percent of whites compared to just 38.3 percent of the minorities. In addition, the study found whites also averaged approximately twice as many visits to any doctor for psoriasis. Researchers found whites averaged 2.69 visits per year, compared to 1.30 for non-Hispanic minorities. In total, this amounts to over 3 million fewer visits per year for psoriasis among non-Hispanic racial minorities compared with whites.

“When you combine these results with the knowledge that minority patients tend to have more severe disease and a greater negative impact on their quality of life due to their

skin disease, the data really highlight the racial gaps that exist in psoriasis care,” said the study’s senior author Junko Takeshita, MD, PhD, MSCE’15, an assistant professor of Dermatology and Epidemiology at Penn.

The causes of these disparities are varied and complex and are a focus of Takeshita’s ongoing research, but the fact remains that this is a clear problem that needs solving. So if patients, for whatever reason, aren’t seeking care, is there a way to bring the care to them?

One of the preferred treatments for psoriasis is phototherapy using ultraviolet B light. This type of phototherapy involves exposing the skin to ultraviolet light on a regular basis so ultraviolet B rays penetrate the skin and slow the growth of affected skin cells. It typically requires treatment in an office three times per week for 12 weeks, which is a substantial burden for patients, as it pulls time away from work and family obligations and adds to transportation costs.

“We know from interviews with patients that the inconvenience of these frequent visits is one major barrier to office-based phototherapy,” Takeshita said.

So what if patients could undergo phototherapy without visiting the office at all?

“Home-based phototherapy represents a more patient-centered approach, but there is a lack of data comparing its effectiveness to that of the office-based treatments,” said Gelfand, a professor of Dermatology and Epidemiology at Penn. “This has led to decisional uncertainty from patients, dermatologists, and insurers.”

Gelfand is hoping to fill in that data void. He recently received an \$8.6 million contract from the Patient-Centered Outcomes Research Institute (PCORI) to study the effective-

ness of home-based phototherapy. Gelfand will conduct a “pragmatic” trial in 1,050 patients called the LITE (Light Treatment Effectiveness) study. Pragmatic trials are designed to be much more reflective of real world clinical practice. The goal is for his research to not only literally shed light on whether home therapy is as good as office treatments, but also illuminate whether it can especially help minority patients with darker skin tones, thus helping to reduce the racial treatment gap. To find out, his study will have a unique design allowing him and his team to tackle the question head on.

“Historically, people of color are underrepresented in clinical trials and studies, but our research, through PCORI, will be the first ever to specifically and prospectively look at the effects of phototherapy on different skin types,” Gelfand said.

The study will evaluate if the therapy penetrates darker skin as well as it does light skin, if longer treatment times may be necessary for different groups, and what side effects, if any, exist from this treatment. Answering those questions can go a long way toward finding out if patients can self-administer this treatment at home instead of going to a clinic three times a week.

Gelfand credits the work of Takeshita, his former post-doctoral fellow, as a major factor in receiving the PCORI grant.

“This all starts with recognizing disparities in the first place, and Dr. Takeshita’s work in that area has been crucial in that regard,” Gelfand said.

“Ultimately, increasing awareness of these disparities is the first step in trying to provide equitable care and improve outcomes for everyone with this disease,” Takeshita said. ▢

More from Penn Medicine Online

The Path Through Penn Medicine

Three years into their medical school journey, two students who were first profiled in Penn Medicine as they entered in the fall of 2015 share updates on their experiences so far in an online-exclusive article.



Gina Chang shares updates on the Penn Medicine Symphony Orchestra she co-founded, and on her plans to pursue an MPH degree.



Michael Stephens discusses his decision to pursue dermatology and his experience paying it forward mentoring first- and second-year medical students volunteering at a free clinic.

► See more of the Path through Penn Medicine at PennMedicine.org/magazine



In the Fall Issue:

The University of Pennsylvania Health System marks a milestone anniversary of its integration as the nation’s first fully integrated university-based academic health system 25 years ago.

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The leading cause of irreversible blindness, glaucoma tends to appear earlier and progress faster in African Americans, and it runs in families. Can a massive genetic study—and a community outreach campaign—help reverse the trend?

Find out on p. 12.

