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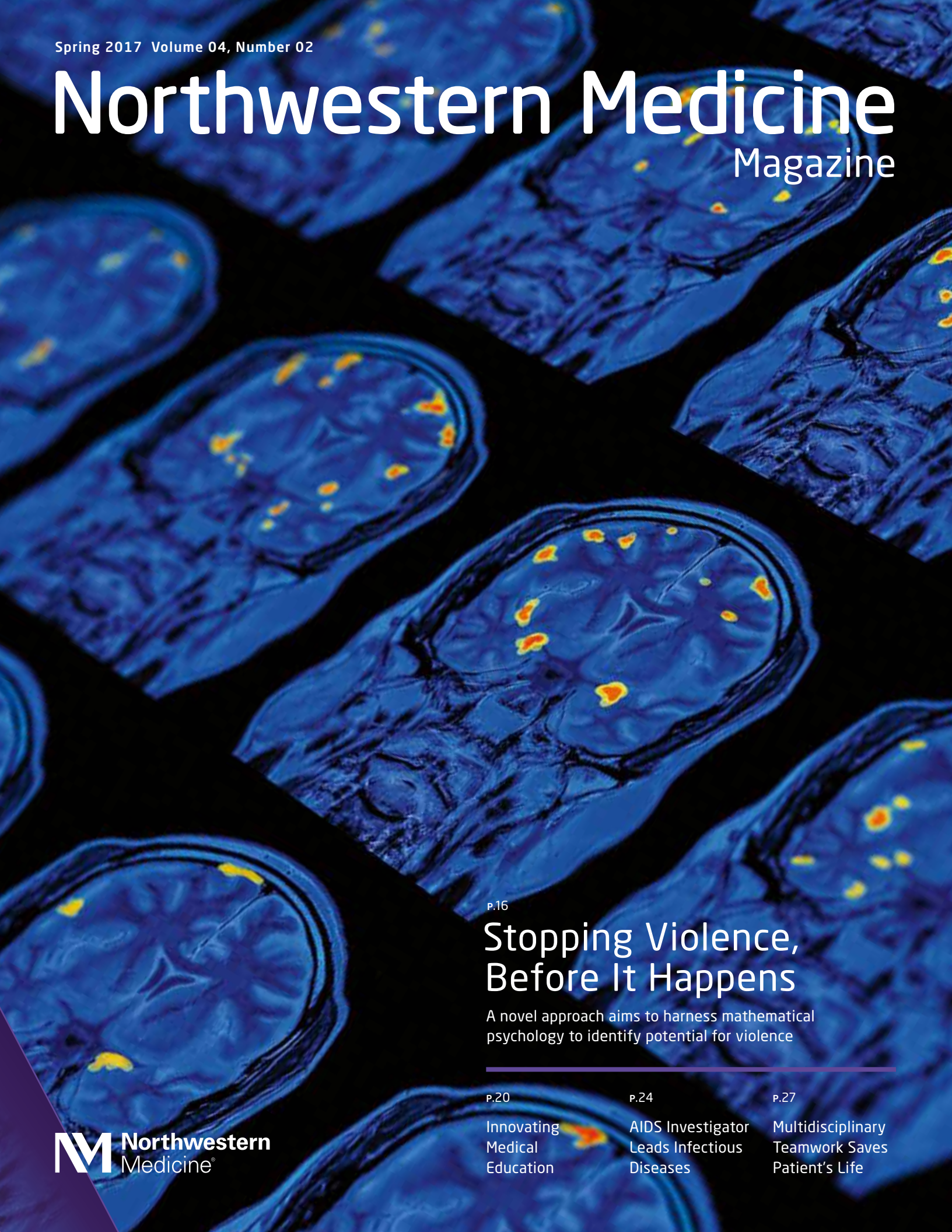
Northwestern Medicine Magazine



Northwestern Medicine®

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ROOPAL KUNDU, '02 MD (LEFT), ASSOCIATE DEAN FOR ADMISSIONS AND THE JACOB R. SUKER, MD, PROFESSOR OF MEDICAL EDUCATION AND DERMATOLOGY, CONGRATULATES ONE OF HER MENTEES IN DERMATOLOGY, FOURTH-YEAR MEDICAL STUDENT JELENA VASIC (RIGHT), ON MATCH DAY.

Northwestern Medicine

SPRING 2017 **Magazine**

VOLUME 04, NUMBER 02

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DESIGN
Firebelly Design

COVER ART: While studying brain reward circuitry (such as the amygdala activity pictured), Hans Breiter, '88 MD, stumbled upon a discovery that led to a mathematical framework for human emotion. Read about how he applies this to violence prevention on P.16.

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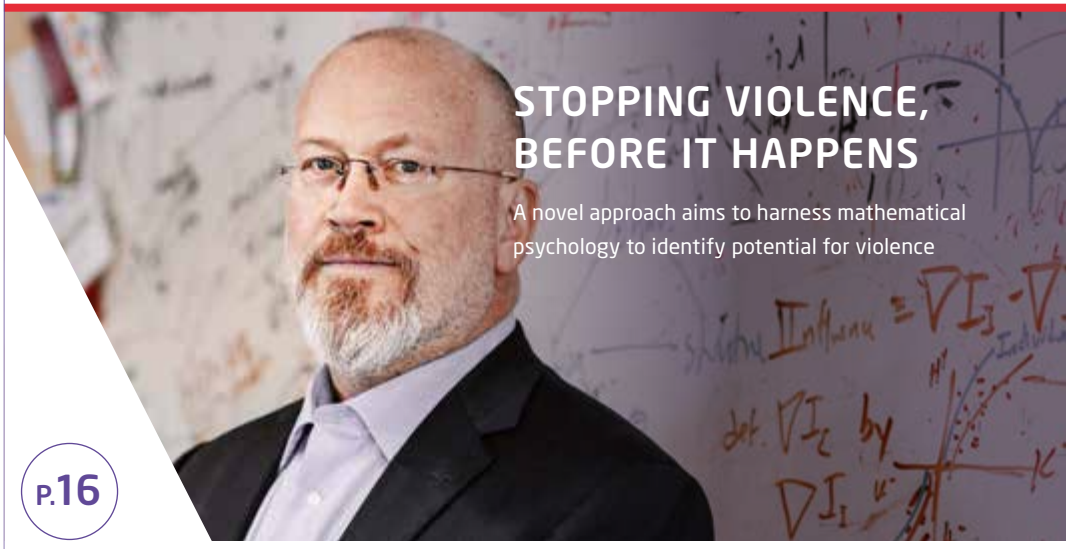
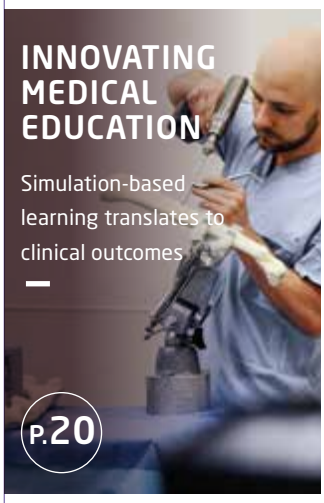


STOPPING VIOLENCE, BEFORE IT HAPPENS

A novel approach aims to harness mathematical psychology to identify potential for violence

P.16



INNOVATING MEDICAL EDUCATION

Simulation-based learning translates to clinical outcomes

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AIDS INVESTIGATOR LEADS INFECTIOUS DISEASES

Taiwo brings international perspective to division

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STRENGTH IN NUMBERS

Multidisciplinary teamwork saves patient's life

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Northwestern Medicine Leadership Message: How We're Transforming Healthcare Through Research

In February, nearly 300 of our principal investigators gathered in a hotel in downtown Chicago to contemplate the future of Feinberg's research enterprise. Working together, these scientists and physician-scientists spent the day brainstorming ideas for the medical school to prioritize in the next five years.

During nearly eight hours and three rounds of discussions, facilitators recorded hundreds of thoughts and suggestions. After each round of dialogue, ideas were projected onto screens around the room, refined, voted upon and ranked. Topics like epigenetics, community partnerships, big data and personalized medicine using stem cells rose to the top during the final ranking process.

Now we must reflect on these ideas and decide how we can best build on our existing strengths to continue advancing our research to transform healthcare. Undoubtedly, this will involve increasing the size of our faculty, ensuring we have the space and infrastructure to support that growth, and solidifying collaborations across Feinberg and other schools at Northwestern University. Research exploring how we can elevate the way we deliver medical education — an area that translates directly to clinical outcomes — will also remain a priority for us. (See p.16 for a story about our exciting simulation-based medical education research.)

Another critical key to our success is partnering with our clinical affiliates, from Northwestern Medicine and beyond. Each is a laboratory to undertake research. We know that only by working together can we enhance quality of care; attract new patients to participate in clinical trials; and improve outcomes with better diagnostics, better therapies and by using big data analytics and precision medicine tools. It's no coincidence that our research growth over the last five years has occurred as our clinical partners expanded, too. (See p.27 to read how a multidisciplinary team of our physicians took collaboration to heart to save a patient with a highly unusual complication post surgery.)

Visualizing where we want to go requires thinking about how far we've come in just half a decade: In 2016, Feinberg received $443.1 million in research awards, a 40 percent increase from 2012. We also ranked 16th in National Institutes of Health funding among all American medical schools, up from 20th in 2012 and 39th in 2002. Feinberg is now ranked 17th among the nation's best medical schools, and Northwestern Memorial Hospital 8th among hospitals, according to *U.S. News & World Report*. These impressive facts and figures confirm that we are well on our way to solidify our place as an elite medical school for years to come.

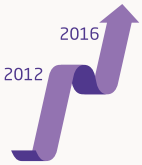
This promise was on display in February at the retreat and again in April at our annual Research Day, where more than 400 students, trainees, staff and faculty proudly presented the findings from their projects and solicited feedback to make their work even stronger. The record-breaking participation in this event celebrating research, the energy and comradery palpable in the conversations that took place that day, painted a striking picture of the way we approach research here at Northwestern Medicine.

With warm regards,

Eric G. Neilson, MD
Vice President for Medical Affairs
Lewis Landsberg Dean

Dean M. Harrison
President and CEO
Northwestern Memorial Healthcare

FEINBERG RECEIVED **$76.1M IN CLINICAL TRIALS FUNDING** IN 2016, UP 72% FROM 2012.



FEINBERG RECEIVED **$443.1M** IN RESEARCH AWARDS IN 2016, A 40% INCREASE FROM 2012.

FEINBERG GENERATES **68% OF ALL RESEARCH DOLLARS** AT NORTHWESTERN UNIVERSITY.

50,000

PATIENTS AND VOLUNTEERS TAKE PART IN CLINICAL TRIALS AND RESEARCH STUDIES AT FEINBERG EACH YEAR.

Rankings Place Feinberg Among Top Medical Schools

WRITTEN BY: Anna Williams

17TH IN US NEWS RANKINGS

Northwestern University Feinberg School of Medicine has maintained its standing among the best research-oriented medical schools, at 17th in the nation, according to the latest *U.S. News & World Report* rankings.

This is the tenth year in a row Feinberg has placed in the top 20 research-oriented medical schools.

"Feinberg continues to distinguish itself as a world-class institution for medical education and research," said Eric G. Neilson, MD, vice president for Medical Affairs and Lewis Landsberg Dean. "Our reputation is a testament to the dedicated work of our faculty, staff and students, and their tireless pursuit to improve human health through innovative research and academic excellence."

Three specialty programs were also recognized as among the best in the nation, with women's health rising to 8th place, an all-time high; internal medicine rising two spots to 15th; and pediatrics maintaining its place at 14th.

The U.S. News rankings are based on survey assessments completed by deans and senior faculty at peer institutions, as well as National Institutes of Health (NIH) research activity and student selectivity, among other factors. The magazine surveyed the nation's 140 fully accredited medical schools and 30 schools of osteopathic medicine.

16TH IN NIH RANKINGS

Feinberg rose to 16th place among U.S. medical schools in funding from the NIH in 2016. These rankings are reported annually by the Blue Ridge Institute for Medical Research.

The Blue Ridge analysis represents grants awarded between October 1, 2015, and September 30, 2016. This year is Northwestern's highest ranking to date. It represents an increase of two spots over 2015 and five spots over 2012, when the medical school was ranked 21st in the nation.

Individual departments at Feinberg also ranked highly in the report: Twelve departments ranked among the top ten in their specialty for NIH funding, while an additional two ranked in the top 20.

Award figures are obtained by Blue Ridge from the Research Portfolio Online Reporting Tools at the NIH. The report's calculations include direct and indirect costs, but do not include contracts or other specialized mechanisms.

DEPARTMENTS IN TOP 20 FOR NIH FUNDING

1ST	» PUBLIC HEALTH (MEDICAL SOCIAL SCIENCES AND PREVENTIVE MEDICINE)
2ND	» OBSTETRICS & GYNECOLOGY » UROLOGY
3RD	» CELL & MOLECULAR BIOLOGY » PHYSICAL MEDICINE & REHABILITATION
5TH	» NEUROLOGY
6TH	» DERMATOLOGY
8TH	» NEUROLOGICAL SURGERY » PHYSIOLOGY
9TH	» SURGERY
10TH	» PHARMACOLOGY
17TH	» INTERNAL MEDICINE » OTOLARYNGOLOGY

Medical Students Celebrate Match Day 2017

WRITTEN BY: Anna Williams

See more photos from Match Day 2017 at *magazine.nm.org.*

On March 17, Feinberg's fourth-year medical students tore open their white envelopes and learned where they will spend their first years as physicians.

Match Day, an annual tradition held on the third Friday of March, is the day when all fourth-year students across the country find out where they will train as residents for the next three to seven years.

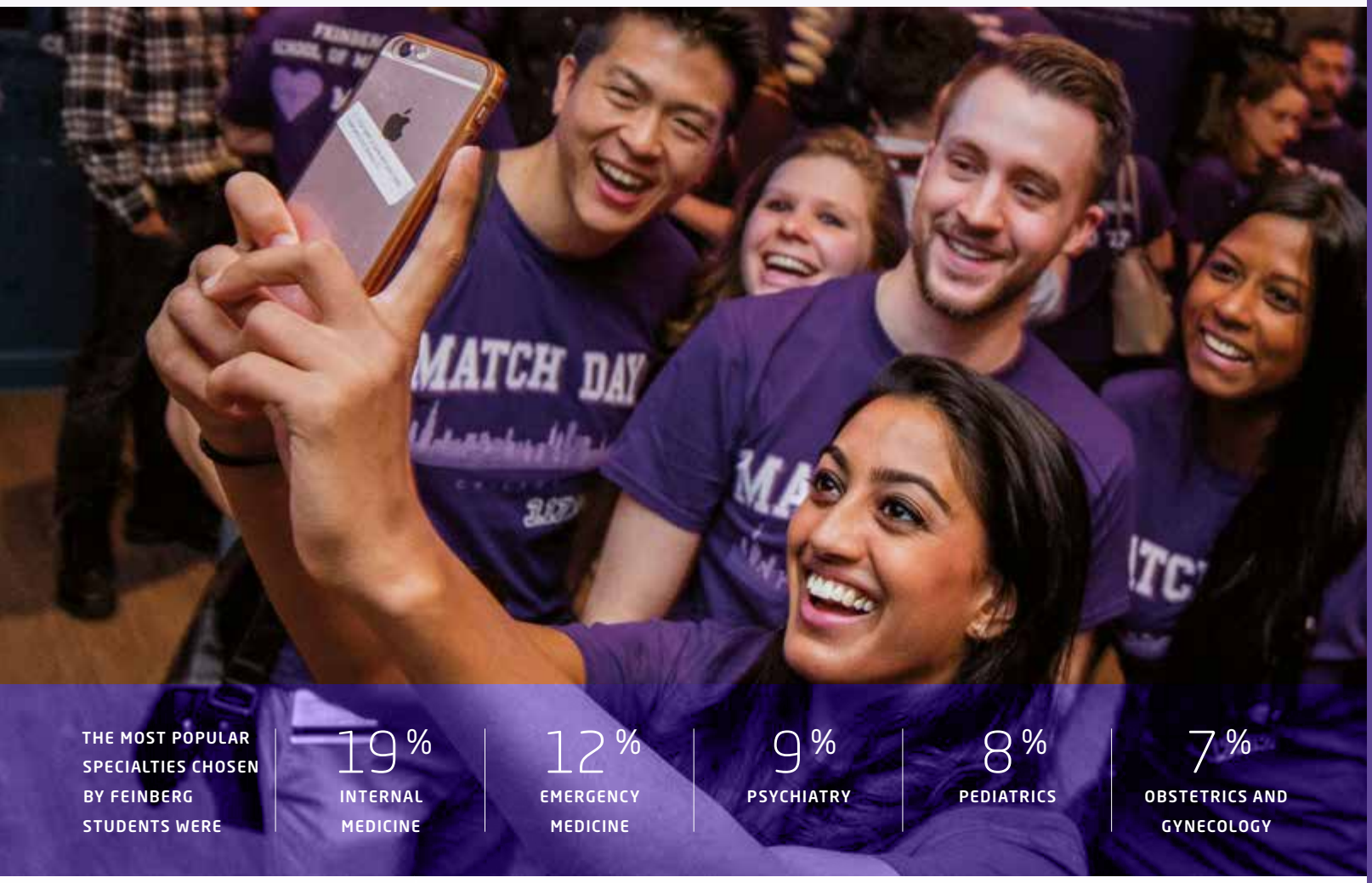
At Northwestern, the room erupted in cheers at 11:30 a.m. as the envelopes were opened in unison. The class of 2017, surrounded by friends, family and faculty, celebrated the success of their medical school journey and the beginning of the next phase of their medical careers.

"The atmosphere here today was incredible. It felt like the roof was going to lift off with all the energy," said Richard Greendyk, who matched in internal medicine at New York-Presbyterian Hospital at Columbia University Medical Center. "Everyone was incredibly happy when they opened their letters, and this really wouldn't have happened without all the phenomenal support we've gotten here over the last four years."

Residency matches are made by the National Resident Matching Program (NRMP), which uses a computerized algorithm to pair graduating medical students with available training positions at U.S. teaching hospitals. The model takes into account the top choices of both the students and the residency programs. This year's Match Day was the largest in history, with a record 43,137 registered applicants vying for more than 31,000 residency positions.

Mia Helfrich and Charles Qin entered the match as a couple. Both students matched in orthopaedic surgery, with Helfrich at the McGaw Medical Center of Northwestern University and Qin at the University of Chicago Medical Center. "It was very nerve-racking, standing there with our envelopes before we counted down, but we're so happy we matched in the same city," Helfrich said. "I'm really looking forward to spending another five years training here at Northwestern."

Parul Kathuria, an Honors Program in Medical Education student who has studied at Northwestern for the last seven years, also chose to continue her medical career at McGaw, where she matched in dermatology and internal medicine. "I've had some amazing mentors here in both the dermatology and internal medicine departments, and I'm thrilled to be staying," she said. "The Northwestern community is rich with such a wide variety of students from all kinds of backgrounds. It really is a special place to do your training."



THE MOST POPULAR SPECIALTIES CHOSEN BY FEINBERG STUDENTS WERE

19%	12%	9%	8%	7%
INTERNAL MEDICINE	EMERGENCY MEDICINE	PSYCHIATRY	PEDIATRICS	OBSTETRICS AND GYNECOLOGY

Brittany Vieira celebrated her match at Brigham and Women's Hospital in Boston, where she'll begin her training as a plastic surgeon. "I think Feinberg does an unbelievable job fostering exactly the person you want to be. They let me learn medical education exactly the way I needed to, and I think that freedom and support is what got me into Harvard plastic surgery," Vieira said. "It was an unbelievable moment today. To have that many people realize their dreams in one second, in one room — there's just nothing like it."

Medical Students and Physicians Volunteer Skills at Devon Clinic

WRITTEN BY: Anna Williams

Even in the midst of a busy schedule of basic science lectures, exams and clinical training, first-year medical student Marcus Byrd puts a priority on volunteering in health clinics around Chicago. "One of the reasons I chose to attend Northwestern was because of its prestigious education, and I thought it would be a disservice not to share that education with patients who are, on average, disadvantaged," he said. "I try to make time for volunteering as often as I can."

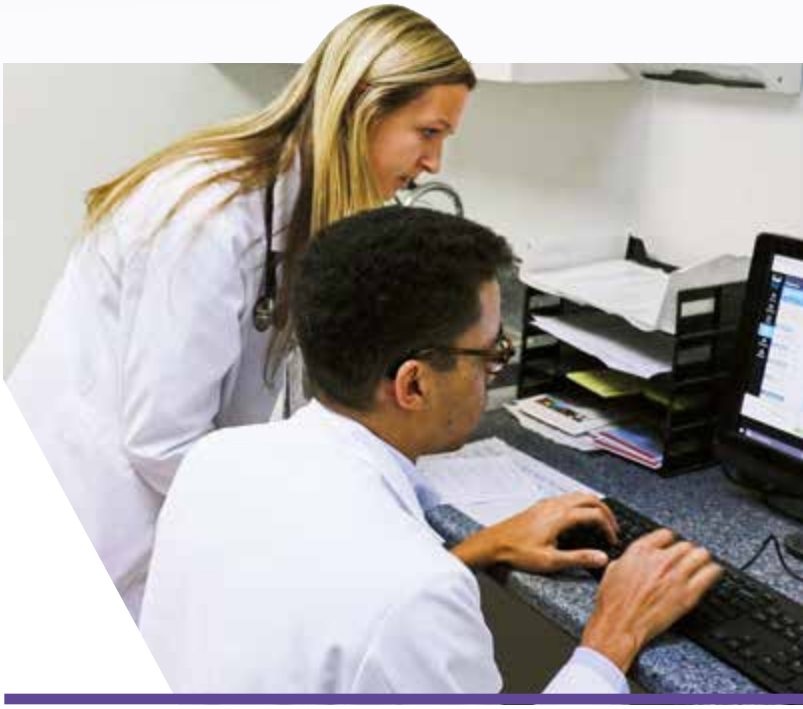
On one snowy Sunday morning this winter, Byrd joined a group of six Feinberg medical students and traveled north to Rogers Park, a neighborhood on Chicago's Far North Side. There, at the Indian American Medical Association of Illinois Charitable Foundation Clinic (IAMACF) on Peterson Avenue, the students spent their day caring for the area's underserved patients.

The IAMACF is one of seven community clinics staffed by Feinberg student volunteers throughout the city, from Chinatown to the West Side. At these "student-run clinics," medical students provide free healthcare to diverse patient populations and practice their clinical skills under the guidance of a volunteer attending physician.

At the IAMACF, students and physicians come largely from Feinberg and Northwestern Medicine hospitals, but are also drawn from other local medical centers. Together, the volunteers provide free primary care services, medications and lab tests to the clinic's uninsured, predominantly South Asian patients. In a nod to the patient population, the clinic is more commonly referred to as "the Devon Clinic," after the nearby street stocked with South Asian restaurants and businesses.

Medical students are core to the clinic's ability to provide care. Every Sunday from 10 a.m. until 2 p.m., the students meet privately with patients in six different exam rooms, taking detailed medical and social histories, measuring vital signs, performing physical examinations, updating medical records, documenting medication regimens and offering nutrition counseling for chronic conditions like diabetes, hypertension and hyperlipidemia. After meeting with patients, the students present case summaries and their recommendations to an attending physician, who provides input and prescribes medications and lab tests, if necessary.

"This clinic would simply not run without medical students," explained Rajan Shah, MD, health system clinician in the Department of Medicine, Division of General Internal Medicine and Geriatrics, who volunteers at the clinic with his wife, a physician at Rush University Medical Center. "As attending physicians, we are the consulting entity and we sign off on everything. But the medical students are the foundation of care. They are creating a big change in people's lives, even as trainees."



FIRST-YEAR MEDICAL STUDENT MARCUS BYRD UPDATES A PATIENT'S MEDICAL RECORDS WHILE VOLUNTEERING AT THE INDIAN AMERICAN MEDICAL ASSOCIATION OF ILLINOIS CHARITABLE FOUNDATION CLINIC.

Feinberg students also serve as coordinators, helping manage the clinic, recruit other medical students and physicians, and orient new volunteers.

> "The medical students are the foundation of care. They are creating a big change in people's lives, even as trainees."

Avni Bavishi, now a second-year student, served as a coordinator for the clinic last year. "I got involved with the Devon Clinic because I was excited about the opportunity to help an underserved population. As a coordinator, I also had the chance to see

what goes on behind the scenes in a free clinic and got a deeper understanding of how vital it is that organizations like this exist," Bavishi said. "The experience gave me great exposure to managing chronic disease in a primary care setting and practice with skills I'll need for the rest of my life."

"You do see some hard cases, and sometimes it can be stressful, but I love it here," added Ankita Devareddy, a first-year student and one of four current co-coordinators at the clinic, who volunteered at IAMACF while an undergraduate student at Northwestern, interpreting for patients who spoke Hindi and Telugu. "This clinic reminds me of why I wanted to go into medicine in the first place."

It's a sentiment shared not only by students, but by the Feinberg faculty who volunteer at IAMACF as well.

"I feel so grateful to be able to do this," Shah said. "Burnout can be a problem for some physicians, but I feel that the fulfillment we receive from even just one day here at the clinic is exponential — because we're doing what we went into medicine for, and providing care for people who would be turned away elsewhere. It's really a win-win that makes the whole community better off."

Our alumni are active volunteers, too! On p.37, John Sager, '91 MD, describes his experience providing medical care to Syrian refugees.

Northwestern Medicine Expands Bluhm Cardiovascular Institute

A philanthropic gift of $2.5 million will support the expansion of the renowned Northwestern Medicine Bluhm Cardiovascular Institute with a new hub at Northwestern Medicine Central DuPage Hospital in Winfield and clinical care services at Northwestern Medicine Delnor Hospital in Geneva and Northwestern Medicine Kishwaukee Hospital in DeKalb.

"This expansion is a unique opportunity to offer the highest level of academic medicine and research in a community hospital setting," said Patrick McCarthy, MD, executive director of the Bluhm Cardiovascular Institute and chief of Cardiac Surgery in the Department of Surgery. "Developing true connections across the entire Northwestern Medicine health system to share talent and knowledge will ensure we are providing exceptional and all-encompassing cardiovascular care to all Northwestern Medicine patients."

The $2.5 million donation is composed of many unrestricted gifts to the Northwestern Memorial Foundation from donors in the community to Central DuPage and Delnor hospitals over many years.

The Bluhm Cardiovascular Institute was established in 2005 under the leadership of McCarthy with a generous gift by Chicago real estate developer and philanthropist Neil Bluhm. Since then, Northwestern Memorial Hospital's cardiology and heart surgery program has gone from unranked to 6th nationally as rated by *U.S. News and World Report*. Northwestern Memorial is also currently ranked first in the country for heart failure survival and second for heart attack and stroke survival in Medicare patients, the triple threat of cardiovascular disease.

"Creating this institute was the best investment I've ever made," said Bluhm. "It is exciting to expand the geographical reach of the program to offer more patients access to leading-edge cardiac care, complex heart procedures and clinical trials close to home."

Six niche centers within the Bluhm Cardiovascular Institute will be developed in the western suburbs with a focus on coronary disease, heart failure, heart rhythm disorders, heart valve disease, preventive cardiology and vascular disease. The expansion will also streamline and enhance coordination for west suburban patients who may require heart transplantation or other cutting edge treatment at Northwestern Memorial Hospital.

Potocsnak Gift Supports Biomedical Research Center

WRITTEN BY: Marla Paul

Chicago industrialist John Potocsnak made a transformative gift to Northwestern University Feinberg School of Medicine in support of the Louis A. Simpson and Kimberly K. Querrey Biomedical Research Center.

This gift brings the total contributions to the "We Will. The Campaign for Northwestern Medicine" to $1.5 billion in donations. The goal of the entire campaign for Northwestern Medicine is $1.75 billion.

The donation names the new building's lobby atrium the Potocsnak Family Lobby Atrium and a floor of research labs.

"This generous gift from the Potocsnak family will help accelerate our pace of discovery, heighten the collaborative nature of leading-edge research conducted at Northwestern and develop the next generation of physician-scientists," said Eric G. Neilson, MD, vice president for medical affairs and the Lewis Landsberg Dean at Feinberg. "John and Laura have been exceptional philanthropists for many years, and we are extraordinarily grateful for their unwavering support of our mission to transform human health."

The Potocsnak Family Lobby Atrium is a highly visible first-floor space that will welcome the campus community and visitors to the Simpson Querrey Biomedical Research Center and serve as a site for numerous events, poster sessions and other professional gatherings. The lobby also will extend and expand the food court commons that is currently available to students, faculty and visitors to the Robert H. Lurie Medical Research Center.

Additionally, each research floor of the Simpson Querrey Biomedical Research Center will have more than 40,000 square feet and 138 research benches for Northwestern scientists. Floors will house senior principal investigators, technicians, laboratory assistants, postdoctoral students and research faculty.

THE POTOCSNAK FAMILY LOBBY ATRIUM WILL BE THE FIRST-FLOOR SPACE IN THE SIMPSON QUERREY BIOMEDICAL RESEARCH CENTER.

Potocsnak, the chief executive officer of Corrugated Supplies Co., and his wife, Laura, have been Northwestern donors for more than a decade. They established the Potocsnak Family C.S.C. Professorship, which is held by Frank Palella, MD, '90 '92 GME, professor of Medicine in the Division of Infectious Diseases.

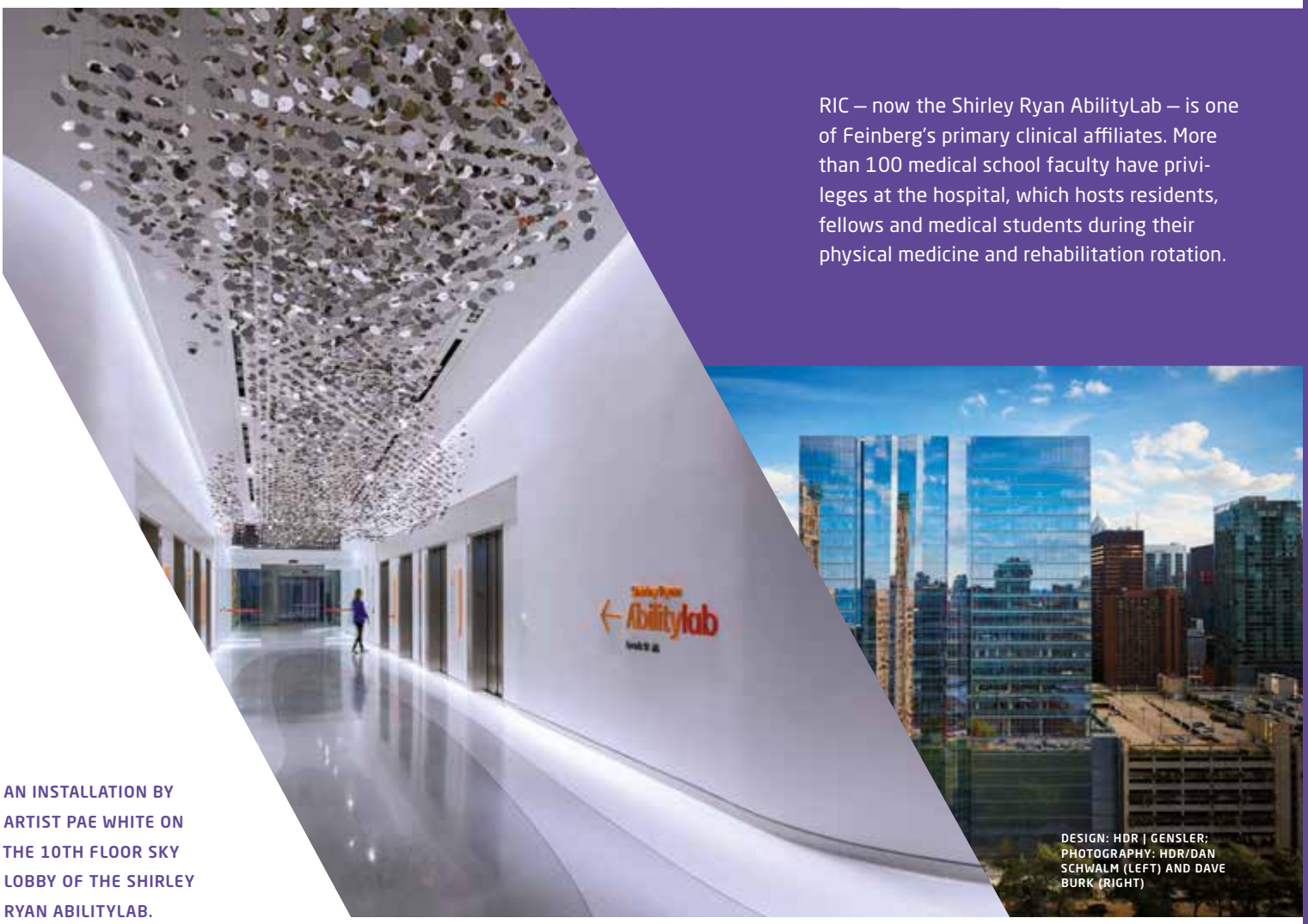
"It's important for my family and me to meaningfully support Chicago institutions like Northwestern that are not only making an impact locally, but also at national and international levels," Potocsnak said. "I am proud to support Northwestern, and hope that the research taking place here at Feinberg will make a real difference in people's lives and ultimately lead to cures."

When complete, the Simpson Querrey Biomedical Research Center at Feinberg will provide new space for biomedical scientists working in cancer, heart disease, neurodegenerative disorders and genetics. It will help draw the most talented research faculty, doctoral students and postdoctoral fellows, and it will provide new research opportunities for medical students, residents and clinical fellows on both the Evanston and Chicago campuses.

The "We Will" Campaign for Northwestern Medicine was launched to inspire and to provide crucial resources that will propel innovation and excellence across the academic medical center. Through the campaign, Northwestern University Feinberg School of Medicine and Northwestern Memorial Foundation are working together to raise $1.75 billion to provide crucial resources. All funds raised will count toward Northwestern University's overall campaign goal of $3.75 billion.

RIC's Shirley Ryan AbilityLab, First-Ever 'Translational' Research Hospital, Opens

WRITTEN BY: Megan Washburn



AN INSTALLATION BY ARTIST PAE WHITE ON THE 10TH FLOOR SKY LOBBY OF THE SHIRLEY RYAN ABILITYLAB.

DESIGN: HDR | GENSLER; PHOTOGRAPHY: HDR/DAN SCHWALM (LEFT) AND DAVE BURK (RIGHT)

RIC — now the Shirley Ryan AbilityLab — is one of Feinberg's primary clinical affiliates. More than 100 medical school faculty have privileges at the hospital, which hosts residents, fellows and medical students during their physical medicine and rehabilitation rotation.

On March 25, the Rehabilitation Institute of Chicago (RIC) officially became known as the Shirley Ryan AbilityLab as it opened its doors to a cutting-edge research hospital of the same name.

Located at 355 E. Erie Street in Chicago, the $550 million, 1.2-million-square-foot AbilityLab is the first-ever "translational" research hospital in which clinicians, scientists, innovators and technologists work together in the same space, 24/7, surrounding patients, discovering new approaches and applying research in real time.

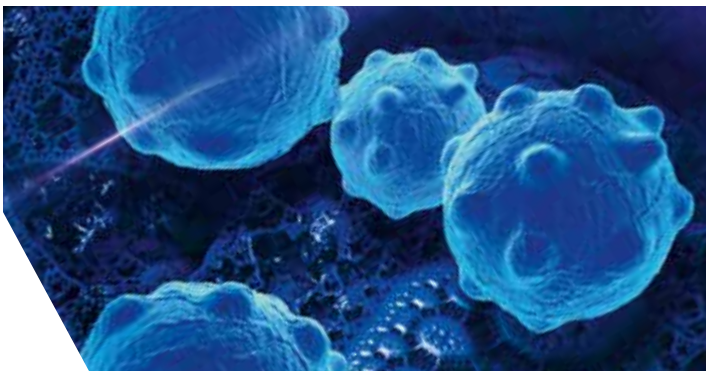
"The Shirley Ryan AbilityLab is the only hospital in the world where doctors focused on solving patient challenges now work side-by-side with scientists focused on finding cures," said Jude Reyes, chairman of the hospital's board of directors. "The result is focused discovery and innovation on behalf of patients, who will be poised to achieve their best possible recoveries here."

The AbilityLab introduces its model of care through five Innovation Centers focused on areas of biomedical science with extraordinary promise:

- Brain Innovation Center
- Spinal Cord Innovation Center
- Nerve, Muscle & Bone Innovation Center
- Pediatric Innovation Center
- Cancer Rehabilitation Innovation Center

Research Briefs

More details on these studies are online at *magazine.nm.org.*



Molecule Stops Fatal Pediatric Brain Tumor

Northwestern Medicine scientists found a molecule that stops the growth of an aggressive pediatric brain tumor called diffuse intrinsic pontine glioma (DIPG). Every year, about 300 children under the age of 10 in the U.S. develop the fatal tumor.

The study, published in *Nature Medicine*, is the result of collaboration between scientists at Feinberg and the Ann & Robert H. Lurie Children's Hospital of Chicago.

"To the best of our knowledge, this is the most effective molecule so far in treating this tumor," said senior author Ali Shilatifard, PhD, Robert Francis Furchgott Professor of Biochemistry and Pediatrics. "Every other therapy that has been tried so far has failed."

The molecule works by detaching proteins called bromodomain proteins from their binding to a mutant protein, histone H3K27M, which is present in more than 80 percent of DIPG tumors. Shilatifard's lab previously identified the pathway through which the mutation causes the cancer in studies with fruit flies.

In this study, scientists took DIPG tumor cell lines from an untreated pediatric patient, injected them into the brain stem of a mouse and then treated the engrafted human tumor with the molecule. The molecule stopped the tumor cells from growing and forced them to turn into other types of cells, thereby halting the cancer's growth.

"This discovery is the perfect example of how we take basic science discoveries and translate them to cure diseases at Northwestern Medicine," said Shilatifard, who is also chair of Biochemistry and Molecular Genetics and a member of the Robert H. Lurie Comprehensive Cancer Center of Northwestern University.

The research was supported by grants RO1NS093079 and R35CA197569 from the National Cancer Institute of the National Institutes of Health.

Lurie Cancer Center to Lead Trial for Rare Cancer Patients

A novel national trial for people with no established alternative to treat their rare cancers is being co-led by Northwestern Medicine investigators at the Robert H. Lurie Comprehensive Cancer Center of Northwestern University.

The clinical trial, called DART, will offer eligible cancer patients a combination of two immunotherapy drugs that help reactivate the patients' own immune system to fight cancer. The aim of the trial is to determine if the drugs, given in six-week cycles, can significantly shrink tumors.

"The DART trial offers a vital safety net for people with rare cancers who currently often fall between the therapeutic cracks," said Frank Giles, MD, chief and Johanna Dobe Professor of Hematology/Oncology in the Department of Medicine and one of four principal investigators of the study.

Many people with rare cancers — about 20 percent of cancers diagnosed — aren't eligible for molecularly targeted cancer therapies because genetic testing of their tumor doesn't show a match for a specific drug. When traditional chemotherapy fails, they often don't have an established effective alternative.

Rare cancers have less than a 6 in 100,000 incidence per year. They include dozens of individual diseases, including cancers in nerves, glands, bones and skin.

The DART trial is funded by the National Cancer Institute. Bristol Myers Squibb is providing the study drugs for the DART trial.

Overexpression of Protein Improves Cardiac Efficiency

Scientists revealed the role of a protein, SNRK, in cardiac tissue metabolism, a finding that may lead to new insights in treating heart failure.

In a *Nature Communications* paper, the scientists show that overexpression of SNRK alters heart tissue by reducing its metabolism of fatty acids and glucose, while retaining normal function.

"This was quite surprising to us," said lead author Hossein Ardehali, MD, PhD, professor of Medicine in the Division of Cardiology and of Pharmacology. "The heart usually uses about 70 percent fatty acids and 30 percent glucose. Under disease conditions, this ratio reverses. It has never been shown that the metabolism of both of these substrates are reduced simultaneously in a normal heart."

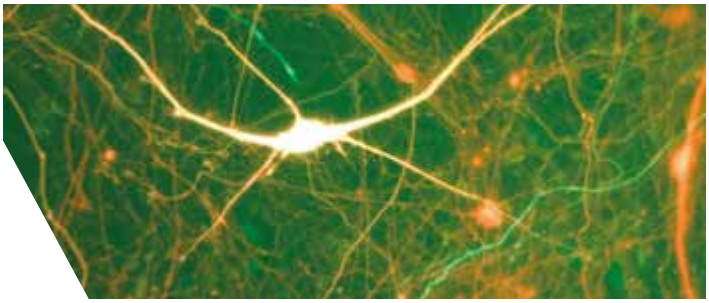
Using mouse models, the scientists further demonstrated that mice overexpressing SNRK were protected against ischemic heart disease, which restricts blood flow to the heart, damaging cardiac tissue by reducing the amount of nutrients such as oxygen, fatty acids and glucose.

The scientists also found that mitochondria become more metabolically efficient and leak fewer electrons in the presence

of increased levels of SNRK. They showed the opposite effect on mitochondria in mice without the SNRK protein.

"Our goal is to activate this pathway and improve metabolic efficiency of the heart," Ardehali said.

The study was supported by National Institutes of Health grants HL107448, HL087149, HL104181, HL108795, HL108379 and the American Heart Association.



Regulating Sodium Channels in Epilepsy

A recent study may help explain why patients with the same epilepsy gene mutation experience different levels of disease severity. The findings, published in the *Proceedings of the National Academy of Sciences*, also reveal new insights into sodium channel regulation and a potential therapeutic target for epilepsy treatment.

Epilepsy, which affects 1 in 100 people worldwide, is a neurological disorder characterized by recurrent seizures. It often has a genetic basis, especially through mutations in genes that encode sodium channels, such as the human SCN2A gene. But previously it had been unclear why patients with the same gene mutation show a wide range of disease severity, such as in their frequency of seizures.

The scientists investigated this variability using a mouse model of Scn2a epilepsy, developed by co-author Jennifer Kearney, PhD, associate professor of Pharmacology. The mice all had epilepsy caused by the same mutation on the Scn2a gene, but they came from two different laboratory mice strains — or genetic backgrounds — and displayed various degrees of epilepsy severity.

"We looked at some of the basic properties of brain cells that are abnormal in epilepsy and found that brain cells from animals that are more severely affected by epilepsy are hyperexcitable, compared to brain cells from animals who are less affected," said first author Christopher Thompson, PhD, research assistant professor of Pharmacology.

The scientists discovered that such differences in the excitability of neurons correlated with changes in the behavior of sodium channels, which were modulated by an enzyme called calcium/calmodulin protein kinase II (CaMKII). When CaMKII was inhibited, neuronal excitability was suppressed — suggesting that targeting CaMKII activity may be a novel route to treating epilepsy.

Alfred George, Jr., MD, chair and Magerstadt Professor of Pharmacology was principal investigator of the study.

The research was supported by National Institutes of Health (NIH) grants NS053792 and NS032387 and Epilepsy Foundation Postdoctoral Fellowship 189645.

Media Spotlight

1 BASEBALL HITTING, PITCHING SAPPED BY JET LAG

AP

Scientists say they've documented an unseen drag on major league baseball players that can wipe out home field advantage, make pitchers give up more homeruns and take some punch out of a team's bats. The culprit: jet lag. Ravi Allada, MD, professor of Pathology, and his colleagues wanted to study the effects of body clock disruptions on human performance. So they chose baseball, a game with plenty of performance measures gathered from hundreds of games a year, played by people who get little chance to settle in to new time zones when they travel. Their analysis was released by the *Proceedings of the National Academy of Sciences.*

2 HEALTH ILLITERACY IS COSTLY AND CAN BE DEADLY

CNN

Margaret Danilovich, '07 PT, '07 DPT, PhD, instructor of Physical Therapy and Human Movement Sciences, wrote a column explaining why it's important to help patients improve their health literacy and described some current efforts underway to do so. "Early in my career as a physical therapist, patients who missed appointments or did not complete their home exercise program frustrated me. I found myself blaming patients for not improving while not fully realizing I was the one who needed to change. As I gained more experience, I recognized that patients were not ignoring my instructions; they simply did not understand what to do," she wrote.

3 THE SOUND OF 'PINK NOISE' IMPROVES SLEEP AND MEMORY

TIME

A small new study published in *Frontiers in Human Neuroscience* suggests that one easy way for older adults to get deeper sleep and stronger memories is to listen to a certain soothing sound called "pink noise" – a mix of high and low

EVE FEINBERG, MD

INGER BURNETT-ZEIGLER, '09 PHD

Faculty Raise Awareness Through Op-Eds

The medical school's faculty members often serve as expert sources for news outlets covering healthcare topics. And sometimes, they write for these outlets themselves. Here, Eve Feinberg, MD, assistant professor of Obstetrics and Gynecology in the Division of Reproductive Endocrinology and Infertility, and Inger Burnett-Zeigler, '09 PhD, assistant professor of Psychiatry and Behavioral Sciences, who have published op-eds in the *Washington Post*, *Chicago Tribune*, *Time*, *The Hill* and beyond, describe why they write.

Q **Why do you think it's important to share your thoughts and experiences through op-eds?**

EF Op-eds are a great medium to educate the public. As a specialist, we are taught to publish in scientific journals, which is great among your peers and colleagues. However, the general public

frequencies that sounds more balanced and natural than its better-known cousin, "white noise." "The effect here, at least for memory, is quite related to the ability of the sound stimulus to enhance slow-wave sleep," said senior author Phyllis Zee, MD, PhD, '87, '89 GME, chief of Sleep and Circadian Medicine in the Department of Neurology.

4 PARENTS OF PREEMIES WILL SOON HAVE AN APP

CRAINS CHICAGO BUSINESS

Craig Garfield, MD, associate professor of Pediatrics and Medical Social Sciences, is developing a smartphone app that directly connects new parents to real-time information about their babies in intensive care. The app, called SMART NICU2HOME and still in the development stages, aims to provide a child's real-time vital statistics, plus a selection of research about the baby's condition that is better curated — and less panic-inducing — than late-night Google searches. "No parent expects their baby to be in the neonatal intensive care," said Garfield. "It's shocking: They've lost all their touchstones and expectations. We want to give them the key pieces of information that can make this difficult time more manageable."

5 NORTHWESTERN MEDICAL STUDENTS DECRY EFFORTS TO REPEAL OBAMACARE

CHICAGO TRIBUNE

Dozens of students and faculty laid down their white coats to raise awareness about people who may lose their health insurance with changes to the Affordable Care Act. *The Chicago Tribune* visited campus to film the student-organized demonstration, and medical student Wil Gibb took photos.

does not read the scientific literature. The lay press gets a lot of information from a variety of sources and the science is often clouded by the politics. I hope that as a clinician-scientist and an educator I can not only educate my students, but also the general public on very important issues in women's health.

IBZ It is important to me that community members and policymakers have immediate access to the critically important information that is gained by conducting rigorous research. Additionally, I believe that it is important that clinical researchers have a voice in conversations about mental health issues that occur in everyday life as we have unique clinical and research expertise that brings perspective to the conversation. I also believe that as a South Side Chicago native, and an African-American woman in academia, I have a social responsibility to serve my community through my research, clinical care and my voice.

What messages do you want to get across to your readers?

EF I am passionate about the idea of reproductive choice. Reproductive choice is a spectrum that encompasses our ability to choose when to have a baby (or not), with whom and by what means. We need to make ethical and informed choices that are based in facts and not politics.

IBZ I want to raise awareness about the prevalence of mental illness and the gaping treatment gaps. I hope to reduce the stigma, negative attitudes and beliefs associated with mental illness and participation in treatment. It is important that people are aware of the negative effects of mental illness to overall health, well-being and productivity. I hope that increased awareness will lead to a prioritization of funding high-quality evidence based mental health services in underserved community based settings.

Feinberg and Burnett-Zeigler participated in Northwestern University's Public Voices Thought Leadership Fellowship Program this year, a partnership with the OpEd Project, which aims to increase the range of voices and quality of ideas heard in academia and the world at large. Read their full Q&A at nm.magazine.org.

Faculty Awards and Honors

More Awards and Honors are online at *magazine.nm.org.*

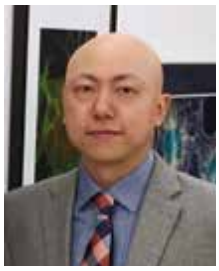
PAULA STERN, PHD, WITH CURRENT AND FORMER COLLEAGUES AND COLLABORATORS AT AN EVENT HONORING HER CAREER.

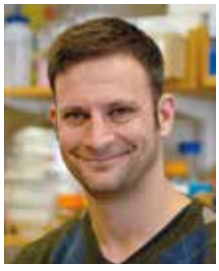
Paula Stern, PhD, professor emeritus of Pharmacology was recently recognized at her retirement reception. Having spent more than 51 years at Northwestern, Stern is one of the longest-serving faculty members in the history of the school. She is an authority on bone and mineral health research, and a respected leader and educator.

Stern was one of the founding members of Feinberg's Women's Faculty Organization (WFO) and received its Distinguished Women in Medicine and Science Award. Beginning in 2017, the WFO will present another award in Stern's name to recognize an outstanding female faculty member who demonstrates excellent research, mentorship and leadership. Stern was also the first female president of the American Society for Bone and Mineral Research (ASBMR), which presents the Paula Stern Achievement Award each year to a woman recognized for her significant scientific achievements in bone research. Although she is retiring, Stern is undertaking a project to document the history of the department of Pharmacology.

Lori Post, PhD, has been appointed as the inaugural director of the Buehler Center for Health Policy and Economics and Buehler Professor of Geriatric Medicine in the Department of Emergency Medicine. Previously, Post worked as the research section chief and associate professor of Emergency Medicine at Yale School of Medicine, dealing with issues of elderly populations and geriatric patients, including in the 19 lowest income countries in the world. As a Rockefeller Foundation Fellow Resident, she developed a line of theoretical and applied research that involved public and political will campaigns.

Melissa Simon, MD, '06 GME, the George H. Gardner Professor of Clinical Gynecology, vice chair for clinical research in the Department of Obstetrics and Gynecology, and a professor of Preventive Medicine and Medical Social Sciences, has been appointed to the U.S. Preventive Services Task Force, an independent, volunteer panel of 16 national experts in prevention and evidence-based medicine. The Task Force makes evidence-based recommendations on clinical preventive services, including screenings, counseling and preventive medications on topics such as cancer and diabetes for primary care clinicians and their patients.





Dai Horiuchi, PhD, assistant professor of Pharmacology, and Marc Mendillo, PhD, assistant professor of Biochemistry and Molecular Genetics, have been chosen as a Robert H. Lurie Comprehensive Cancer Center of Northwestern University 2017 Lynn Sage Scholar. The scholars engage in cellular, molecular and genetic research to unlock the mystery of breast cancer.

The Lurie Cancer Center also announced four recipients of the 2017 Liz and Eric Lefkofsky Innovation Research Award, which supports highly innovative cancer-relevant pilot studies that can serve as foundations for larger, nationally funded studies. The new awardees are:

Alfred George, PhD, chair and Magerstadt Professor of Pharmacology for "Physiologic and Genomic Profiling of Ion Channels in Human Brain Cancer"; Kathleen Green, PhD, Joseph L. Mayberry, Sr. Professor of Pathology and Toxicology and associate director, Lurie Cancer Center Basic Sciences Research, for "Surrounded by Bad Neighbors: Do Keratinocyte 'Cancerization Fields' Promote Melanoma Development?"; and Steven Kosak, PhD, assistant professor of Cell and Molecular Biology for "Regulatory Nuclear Translation at PML Bodies During Cellular Stress and Oncogenesis." Ali Shilatifard, PhD, Robert Francis Furchgott Professor and chair of the Department of Biochemistry and Molecular Genetics, received funding to continue his project, "Transcription Elongation Control in Cancer Therapeutics," for a second year.

Sandra Sanguino, '93 MD, '96 '99 GME, MPH, associate dean for Student Affairs, and associate professor of Pediatrics and Medical Education, has received the Exceptional Mentor Award from the American Medical Women's Association (AMWA). The award recognizes physicians who have made significant contributions to the professional and personal development of medical students. The AMWA is a national organization dedicated to advancing women in medicine and improving women's health.

Peng Ji, MD, PhD, assistant professor of Pathology and co-director of the Pathology Physician-Scientist Training Program, recently received a Leukemia and Lymphoma Society SCHOLAR Award. He is the first person at Feinberg to get this award. The five-year, half-million dollar award begins July 1, 2017.

Amy Paller, MD, '83 GME, the Walter J. Hamlin Professor of Dermatology and professor of Pediatrics, is the 2017 recipient of the Stephen Rothman Award, the most prestigious award of the Society for Investigative Dermatology. It is presented for distinguished service to investigative dermatology, in particular for outstanding research contributions and mentoring of the next generation of dermatologists and researchers.

Paller is only the fourth woman to be honored by this award. One of the previous female recipients, Ruth K. Frienkel (1994), was one of Paller's mentors and the first full-time investigative dermatologists at Northwestern.

Donald Lloyd-Jones, MD, ScM, senior associate dean for Clinical and Translational Research and chair of Preventive Medicine, has been selected to receive the 2017 Joseph Stokes, III, MD Award from the American Society for Preventive Cardiology (ASPC) for his achievements in preventive cardiology.

"The Stokes Award is especially meaningful to me as it has previously been awarded to a number of my mentors, including Bill Kannel in 2011, with whom I worked at Framingham, and Jerry Stamler in 2012, Phil Greenland in 2002, and Darwin Labarthe in 2006, who are all current faculty here in our Department of Preventive Medicine at Feinberg," said Lloyd-Jones.

Francesca Duncan, PhD, research associate professor of Obstetrics and Gynecology and executive director of the Center for Reproductive Science, was awarded a Fulbright Scholarship titled "Keeping Reproductive Science and Medicine Visible, Viable and Valuable through Education across the Globe." Duncan will travel to Spain to teach and perform research at the University of Murcia.

Walter Eppich, MD, associate professor of Pediatrics in the Division of Emergency Medicine and of Medical Education, has been named a member of the inaugural group of fellows for the Society for Simulation in Healthcare (SSH) Academy. Fellows are elected based on their outstanding contributions to the development of SSH and the field of healthcare simulation.

Katherine Wisner, MD, the Norman and Helen Asher Professor of Psychiatry and Behavioral Sciences, and of Obstetrics and Gynecology, was selected to receive the American Psychiatric Association's Award for Research in Psychiatry.

Judy Moskowitz, PhD, MPH, professor of Medical Social Sciences and director of Research at the Osher Center for Integrative Medicine, has been elected to the Academy of Behavioral Medicine Research.

Rowland (Bing) Chang, MD, PhD, professor of Preventive Medicine, Medicine and Physical Medicine and Rehabilitation, and Claus-Peter Richter, MD, PhD, professor of Otolaryngology - Head and Neck Surgery, received 2017 Mentor of the Year awards at the 13th annual Lewis Landsberg Research Day in April.

Richard Pope, MD, the Solovy-Arthritis Research Society Professor of Medicine in the Division of Rheumatology, received the 2017 Tripartite Legacy Faculty Prize in Translational Science and Education at Research Day.

HANS BREITER, '88 MD
Professor of Psychiatry and Behavioral Sciences

A novel approach aims to harness mathematical psychology to identify potential for violence

WRITTEN BY: Anna Williams

Stopping Violence, Before It Happens

Throughout the years, experts have tried to stem the global, perpetual problem of violence using a variety of tactics, from targeted policies to amped-up policing. But for Hans Breiter, '88 MD, the solution is a matter of math.

Breiter, a professor of Psychiatry and Behavioral Sciences, is leading the development of a radical, proactive approach to stopping violence using advanced mathematical models of human emotion. Used to pinpoint individuals with the potential to commit violence or terrorism, these models could inform positive interventions to prevent violent acts from occurring in the first place.

Though the concept may sound like the stuff of science fiction, Breiter says it could be implemented in the relatively near future.

"We have now shown proof of concept for critical components of a software system that predicts who has a higher likelihood of producing violence, before they do so," he says. "With further development, the current prototype could possibly reduce violence in cities like Chicago."

No doubt, the practice of predicting violence raises a number of deep ethical questions — but Breiter is intent that the intelligence be used for good. If at-risk individuals could be identified early, he proposes, community organizations and local non-profits could step in with positive measures to produce a different future.

"Bringing people who have not committed violence yet into contact with individuals who can help, whether it's with education, a job or dealing with life stresses, costs much less than increased policing, jail or what happens to a family when one of their members is murdered," says Breiter, who is also director of Northwestern Medicine's Warren Wright Adolescent Center. "With a little intervention, we can increase the chance someone becomes a positive member of society — and doesn't take away someone else's kid."

Currently, there are few metrics to accurately predict which individuals might turn to violence, and most focus on past offenders who might strike again. But to accurately zero in on adolescents who show no history of violence — a group where early intervention might have the most impact — is a much more formidable task. It's one that requires applying engineering principles to violence and mathematical models to messy human emotions, both areas that seem to defy any sense of lawfulness.

But for Breiter, it's an endeavor that has marked much of his career.

FINDING LAWFULNESS IN BEHAVIOR

After racing through four years of mathematics classes at a local college while still in high school, Breiter earned a medical degree through the Honors Program in Medical Education at Northwestern and completed a program in logic and metaphysics at St. Andrew's University in Scotland. He then embarked on a medical career at Massachusetts General Hospital (MGH) in psychiatry and neuroimaging, before delving into neuroeconomics and mathematical psychology.

"I wanted to understand why people make irrational decisions. But I realized we needed to move past older behaviorist models of stimulus-response action and actually use the mathematics of information theory," Breiter says.

At MGH, he dove into quantitative brain morphometry, applying magnetic resonance imaging (MRI) to the study of psychiatric illness. He pioneered multiple analysis techniques using functional MRIs and applied their first use in psychiatry and the emerging field of neuroeconomics. He spent four years working with Daniel Kahneman, PhD, who later won the Nobel Prize in Economics in

2002 for prospect theory, which explores how people make decisions involving risk.

Breiter went on to serve as principal investigator on the Phenotype Genotype Project in Addiction and Mood Disorder from 2003 to 2009, a major scientific collaboration to link brain reward circuitry with genes involved in depression and addiction. In that data, he and his team stumbled across a key discovery that set him on his current path: law-like patterns of human reward-based decisions, a concept the scientists have since termed "relative preference theory." One of the few descriptions of human behavior that meets the criteria for physics-based lawfulness, the breakthrough provided the team with the beginning of a mathematical framework for human emotion.

"We could start getting at deep traits of approach and avoidance with just two minutes of experimental data," Breiter says. For example, during one of the project's experiments, subjects were asked to rate how much they liked 48 randomized pictures, on a scale of negative three to positive three. The scientists then analyzed the results using information theory mathematics. "With a simple set of picture ratings, we could quantify patterns in people's responses and detail their emotional traits."

"I want an anti-violence system, unaligned with the police, that works with foundations to intervene with these youth in a positive, constructive way."

The framework has applications beyond violence prevention, to any field in which emotion may be important, including medicine. For example, measures of emotional traits might reveal a patient is prone to addiction — information physicians could take into account when prescribing pain medications.

Between 2008 and 2010, Breiter published a series of neuroimaging and behavior articles describing relative preference theory, and he has continued to expand the concept since joining the Feinberg faculty in 2011.

"Ultimately, I want to help move behavioral science to the same level of mechanism that goes on with chemistry, molecular biology and genetics," says Breiter, noting a paper he published recently in Frontiers of Psychology on the topic. "Although much more work is needed, this has the potential to affect neuroscience and how we develop pharmacology."

SEEING PATTERNS IN SOCIAL MEDIA

But while such science could have major implications in medicine and other areas as it evolves, Breiter has been intent on applying his discoveries to a more immediate problem: the epidemic of violence.

The project is deeply personal to him. "My father was in a concentration camp. My Eastern-European family was obliterated by the Nazis. And every time I hear about some kid being killed in Chicago, I get very upset. To me, working against violence is a sacred endeavor," Breiter says.

His team has made important practical advancements in the use of relative preference theory. While experiments like picture ratings require active data acquisition from subjects, the scientists have realized the same revealing patterns about behavior can be pulled from more accessible outlets, such as social media posts. That's critical to adapting relative preference theory to predict the potential for violent behavior across large populations not actively involved in experiments.

In short, the software runs complex mathematical models on material publicly available on sites like Facebook or Twitter to measure relative preference traits. After compiling a trait map for

▲ HANS BREITER, '88 MD

More Violence Prevention Research at Feinberg

Breiter isn't the only Northwestern investigator leading violence prevention research. A sampling of scientists throughout the medical school focused on related work:

LINDA TEPLIN, PHD

Owen L. Coon Professor of Psychiatry and Behavioral Sciences

Teplin, who has studied violence for more than 30 years, recently received a grant from the U.S. Department of Justice to study the perpetration and victimization of firearm violence among youth. The grant is an expansion of the Northwestern Juvenile Project, a comprehensive prospective study of health needs and outcomes of delinquent youth. With more than $43 million in funding since 1998, it is one of the largest studies in Feinberg's history.

LORI POST, PHD

Buehler Professor of Geriatric Medicine

Post, a violence prevention expert who joined Feinberg from the Yale School of Medicine in early 2017, is the inaugural director of the Buehler Center for Health Policy and Economics. She recently received funding to investigate gender-based violence in low-income countries, including widow burning and female genital mutilation.

ROBERT HANLON, PHD

Associate professor of Psychiatry and Behavioral Sciences and of Neurology

Hanlon and Brook, who co-direct the forensic psychology research lab at Feinberg, investigate the neuropsychology of violence, including the behavioral personalities and cognitive aspects of psychopaths. To date, the team has published more clinical studies on the neuropsychological profiles of murders than any other lab in the U.S. In two upcoming papers, they identify features of murderers of children, as well as murderers who are female, a rarely studied demographic.

MICHAEL BROOK, PHD, '13 GME

Assistant professor of Psychiatry and Behavioral Sciences

the population, the scientists can annotate whom in that emotional space has committed violence in the past. "And the people who are the nearest neighbors in this 13-dimensonal emotional trait space have a very strong likelihood of doing similar actions," Breiter says.

The scientists have already proven the basic efficacy of such a software system in predicting unethical or violent behavior among people in private organizations. Breiter now hopes to bring it to larger use.

"I hate to use the analogy, but it might remind people of Minority Report, without the science fiction or Tom Cruise," Breiter says, referring to the 2002 film set in a future where psychics help police departments apprehend criminals before they commit their crime.

The system departs from the movie in another key aspect: The endgame is prevention, not punishment. "I want an anti-violence system, unaligned with the police, that works with foundations to intervene with these youth in a positive, constructive way — not in a punitive way," Breiter says. "They have done nothing wrong and the potential for violence is not a crime."

He cites organizations like BUILD Chicago, which specializes in youth violence prevention, as non-profits that might play a role in making such a system a reality. To do so, he is seeking to build a team with a wide range of collaborators, including neuroscientists, artificial intelligence experts, software engineers, ethicists and forensic neuropsychologists.

Robert Hanlon, PhD, associate professor of Psychiatry and Behavioral Sciences and of Neurology, is one such expert who might serve as a consultant on the anti-violence system. "Our research has identified behaviors, tendencies and personality traits that are associated with future violence, so we can help people understand these factors and make informed predictions — because that's really how you prevent violence," Hanlon says. "I hope to help see Hans' ideas come to fruition."

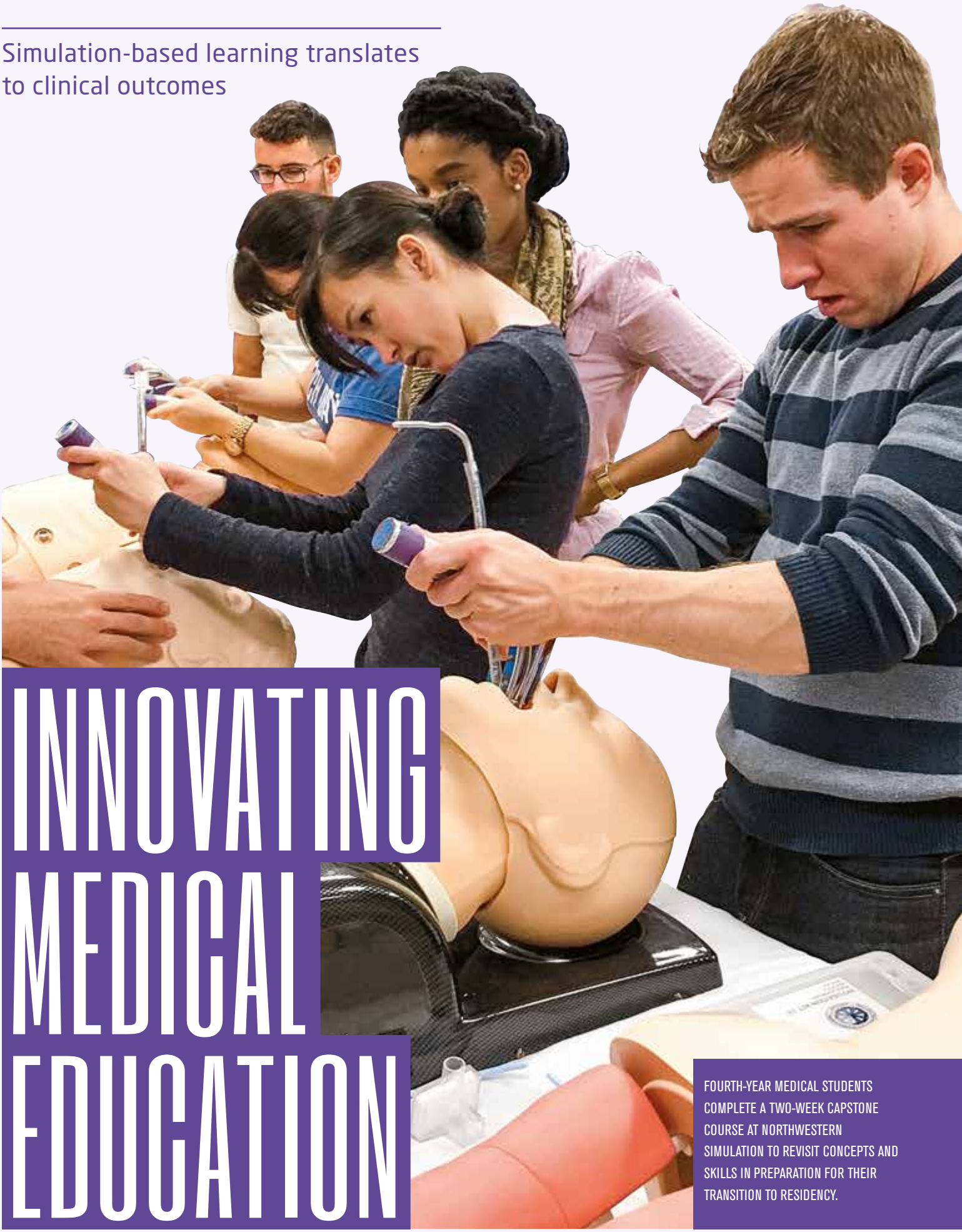
Of course, the system is not without possible risks. While Breiter acknowledges that potential fears of security, privacy and misuse are real concerns, he explains that the software looks for patterns — not specific information. "The social media content is actually irrelevant," Breiter says. "It's the pattern of how you say things, and how they might shift from normative patterns, that is important." To try and counter the potential for its abuse, the anti-violence system would have to be developed with oversight from nonprofit organizations, as well as an ethics board and community engagement.

After seeing positive test results for critical pieces of the program, Breiter is currently exploring funding to build, field-test and optimize such an anti-violence system.

"Violence is a domain that as a society we have to attack head-on," he says. "Instead of spending millions on someone in the criminal justice system, let's get ahead of the violence, before something becomes an irreversible event. The goal is targeted intervention. If we can do that, I believe we can positively affect the world around us."

Simulation-based learning translates to clinical outcomes

INNOVATING MEDICAL EDUCATION



FOURTH-YEAR MEDICAL STUDENTS COMPLETE A TWO-WEEK CAPSTONE COURSE AT NORTHWESTERN SIMULATION TO REVISIT CONCEPTS AND SKILLS IN PREPARATION FOR THEIR TRANSITION TO RESIDENCY.

WRITTEN BY: Sarah Plumridge

38% BETTER PERFORMANCE WITH RESIDENTS WHO UNDERWENT SIMULATION TRAINING

46% HIGHER SCORES THAN RESIDENTS WITH MORE EXTENSIVE TRAINING AND CLINICAL EXPERIENCE

FROM LEFT TO RIGHT: MEDICAL EDUCATION INVESTIGATORS ERIC HUNGNESS, MD, '05 GME; DIANE B. WAYNE, '91 MD; WILLIAM MCGAGHIE, PHD; JULIA VERMYLEN, '11 MD, '11 MPH, '14 GME; AND JEFFREY BARSUK, '99 MD, '02 GME.

In the lower level of McGaw Pavilion, a set of glass doors opens to Northwestern Simulation, a space where countless students, trainees and medical professionals have strived to perfect their clinical skills by participating in simulation-based learning.

Here in the simulation center, Feinberg instructors facilitate a type of competency-based education called mastery learning, which requires students to demonstrate they can perform a skill or task in a simulated environment before working with actual patients.

Studies show that implementing this strategy across undergraduate, graduate and continuing medical education not only improves procedural and communication skills at the bedside, it also leads to better patient outcomes, retained skills and reduced healthcare costs.

According to William McGaghie, PhD, a professor of Medical Education and Preventive Medicine who pioneered mastery learning at Northwestern, it also leads to "excellence for all," with all learners accomplishing all educational objectives with little or no variation in performance.

"Traditional clinical education is often taught using old-fashioned methods that don't always work very well," McGaghie says. "At Northwestern, we set up conditions that allow our bright, hardworking students and trainees to succeed."

During mastery learning, students have a predetermined mastery standard they must achieve to pass a curriculum. After taking a pretest, they perform deliberate practice where they complete multiple focused task repetitions while instructors provide immediate feedback and correct errors. Once learners feel they are performing at a high level of competency, they take a graded assessment. If they don't meet the benchmark, they continue training and retesting until they've acquired the skill. While practice time varies between individuals, the results are uniform – eliminating performance variability.

McGaghie experienced mastery learning techniques as an undergraduate student in a statistics course. His continued interest led him to write a book on mastery learning in competency-based education for the World Health Organization in the late 1970s. And now, nearly 40 years later, the concept is flourishing at Northwestern.

MECHANISMS OF EDUCATION AND HEALTHCARE DELIVERY

Over the years, McGaghie has mentored a number of academic physicians in mastery learning, beginning with Diane B. Wayne, '91 MD, the Dr. John Sherman Appleman Professor and Feinberg's vice dean for Education.

A decade ago, Wayne compared how second-year internal medicine residents applied advanced cardiac life support protocols after receiving simulation-based education versus clinical experience alone. She found that residents who underwent the simulation training performed 38 percent better than the group who had not received additional training. They could also recall and use what they learned up to 14 months later. These results were published in journals including *Academic Medicine*.

"How can we use medical education to address clinical care quality issues at the bedside? To be a world-class education program you have to think carefully about this and then study it," says Wayne, who in 2007 received the National Award for Medical Education Scholarship from the Society of General Internal Medicine and the Thomas Hale Ham Award for New Investigators from the Association of American Medical Colleges (AAMC) for her groundbreaking work.

"I think education is underappreciated for the ability to translate into clinical outcomes," she adds. "Our research impacts the field of medical education on a fundamental level, is applicable at all medical schools in the country and has the ability to be implemented and reproduced in many different settings."

Wayne and McGaghie have gone on to mentor other investigators interested in mastery learning, leading to research projects exploring central venous catheter insertion, common bile duct surgical procedures, intensive care unit ventilator management, healthcare communication and more.

Since 2006, Jeffrey Barsuk, '99 MD, '02 GME, professor of Medicine in the Division of Hospital Medicine and of Medical Education, has used simulation-based mastery learning to train second- and third-year internal medicine residents on central line insertion a month before their rotation in the intensive care unit.

Central lines are typically inserted into the jugular vein to give medications or fluids, take blood for testing and measure blood pressure near the heart. Thanks to Barsuk's training, the rate of central line-associated bloodstream infections from central lines inserted by Northwestern internal medicine residents has fallen dramatically. Complications such as arterial puncture and the number of times the skin was punctured have also been reduced. When annual savings from reduced infections were compared with the annual cost of simulation training, the investigators found a seven-to-one return on investment in one year.

"Using traditional methods, mastery often can't be accomplished because residents cannot focus on pure learning, and they don't have enough opportunities to practice," says Barsuk, who also received a Thomas Hale Ham Award for New Investigators from the AAMC in 2010 for his work.

In 2012, Barsuk and his team rolled out another training on lumbar puncture skills and published the results in the journal *Neurology*. In this study, first-year internal medicine residents at Northwestern who went through simulation-based mastery learning were compared to neurology residents in their second, third and fourth years from three other Chicago academic institutions that received standard residency training. Northwestern's first-year residents scored 46 percent higher than the residents with more extensive training and clinical experience.

"Mastery learning requires a high performance standard and allows us to eliminate much of the variability in healthcare provider skills," Barsuk says. "Using this model has the ability to improve patient safety and reduce healthcare costs in an innovative and novel way."

"MASTERY LEARNING REQUIRES A HIGH PERFORMANCE STANDARD AND ALLOWS US TO ELIMINATE MUCH OF THE VARIABILITY IN HEALTHCARE PROVIDER SKILLS."

Eric Hungness, MD, '05 GME, associate professor of Surgery in the Division of Gastrointestinal and Oncologic Surgery and of Medical Education, saw similar results after delivering a new training course on a common bile duct procedure used to remove gallstones.

In previous studies, Hungness found that laparoscopic common bile duct exploration (LCBDE) treatment for removing gallstones and the gallbladder was underused, despite its clinical advantages. He believed it was due, in part, to a lack of exposure to LCBDE during residency training.

"We are continually trying to innovate in surgical education," says Hungness, who is also the S. David Stulberg, MD, Research Professor. "We didn't feel like we had quality teaching tools, so we had to develop them ourselves."

Hungness implemented a mastery learning curriculum for senior general surgery residents and showed that it improved confidence and performance to mastery level. He published the results in the journal *Surgery* in 2014. Now he's evaluating the effect of the curriculum on clinical utilization, safety and efficacy of the procedure at Northwestern Memorial Hospital. Preliminary data shows an increase in the number of LCBDE procedures from less than 10 percent to 20 percent. It's saved the hospital nearly $40,000 over three years and has a potential return on investment of nearly 15-to-one.

KAMIL BOBER, '16 MD, PRACTICES ORTHOPAEDIC SURGERY SKILLS DURING A COURSE COVERING CASTING, IMPLANTS, ARTHROSCOPY AND SUTURING.

THIRD-YEAR MEDICAL STUDENTS REHEARSE INSERTING IVS FOR THEIR SURGERY CLERKSHIP.

Another important benefit: "It's rewarding to see the residents developing their skills and hear some of the stories about patients being directly impacted," Hungness says.

MASTERY LEARNING IN UNDERGRADUATE MEDICAL EDUCATION

Five years ago, Feinberg introduced a new medical school curriculum that incorporates simulation-based mastery learning beginning from the students' first year to their fourth.

INTERNAL MEDICINE RESIDENTS PRACTICE STABILIZING BREATHING IN A MANNEQUIN WITH SEPSIS.

Since then, medical students have mastered everything from technical procedural skills to communication and interpersonal skills in the rooms of Northwestern Simulation. David Salzman, '05 MD, '09 GME, MEd, director of Simulation for Undergraduate Medical Education and assistant professor of Emergency Medicine and Medical Education, has developed courses to closely align classroom instruction with relevant, hands-on clinical experiences.

At other times, the simulation center hosts courses such as "Breaking Bad News" and "Difficult Conversations," led by Julia Vermylen, '11 MD, '11 MPH, '14 GME, instructor of Medicine, and Gordon Wood, MD, '07 GME, assistant professor of Medicine, where students apply mastery learning techniques to simulations with standardized patients.

"A conversation is a procedure, and like any procedure, it can have lasting complications," Wayne says. "A focus on communication skills ensures that our graduates possess all of the clinical skills they need to competently care for patients starting on day one of their residency training."

This innovative curriculum also includes early patient experiences, such as the Education-Centered Medical Home (ECMH), a longitudinal clerkship. During the ECMH experience, teams of medical students are embedded into primary care clinics throughout their four years to practice clinical skills and to provide continuity of care to patients. The model differentiates itself from traditional education by allowing students to serve as patient advocates and act as educators.

One of the students who participated in the pilot ECMH in 2011, Bruce Henschen, '12 MD, '12 MPH, '15 GME, now assistant professor of Medicine in the Division of General Internal Medicine and Geriatrics, has continued to be involved in the program. In a 2015 paper in *Academic Medicine*, he assessed the outcomes of ECMH on both student education and patient care. He discovered that students who spent time in the ECMH curriculum were more satisfied with their primary care education overall, and they recommended the ECMH to incoming medical students. In addition to educational outcomes, the study found that patients enrolled in the ECMH clinic benefited as well through higher rates of preventive care including influenza vaccination and cancer screenings.

"Students also reported more encouragement from their preceptors to make meaningful connections with patients — a critical skill for all future practicing physicians," Henschen says. In recognition of this innovative education model, Henschen received the 2016 Thomas Hale Ham Award for New Investigators from the AAMC — representing the third time a Northwestern faculty member won this award for medical education research over the past decade.

IMPROVING HEALTH FOR INDIVIDUALS AND POPULATIONS

Going forward, Northwestern faculty are expanding the scope of these models and beginning to apply mastery learning to other departments at Northwestern, as well as across the country and world.

"We are creating the next generation of investigators in medical education research," Wayne says. "By working with the health system on identifying quality targets, we can translate our classroom results to achieve better health outcomes for patients."

With support from an NIH grant, Barsuk is even expanding simulation-based mastery learning to train heart failure patients and their caregivers on how to use ventricular assist devices, which are implanted into the heart to help pump blood flow.

"We knew one of the next steps for our work was patient self-management skills," Barsuk says. "There is very little published research using simulation training with patients and nothing on mastery learning with patients, so we thought this was a natural fit."

Patients and their caregivers are responsible for changing the device's batteries, working its controller and changing the dressings over the entry into the skin. Currently, Barsuk and his team are creating the curriculum and simulator, and training will begin soon.

> "BY WORKING WITH THE HEALTH SYSTEM ON IDENTIFYING QUALITY TARGETS, WE CAN TRANSLATE OUR CLASSROOM RESULTS TO ACHIEVE BETTER HEALTH OUTCOMES FOR PATIENTS."

"When we think about quality issues, a lot of providers don't think about education as a solution," Barsuk says. "The more studies and evidence we provide, the more we will show that rigorous training such as mastery learning has a large role in improving healthcare outcomes."

Taiwo brings international perspective to division

WRITTEN BY: Bridget M. Kuehn

AIDS INVESTIGATOR LEADS INFECTIOUS DISEASES

◀ Babafemi Taiwo, MBBS, '06 GME

Working as a physician at an HIV clinic in Durham, North Carolina, from 1998 to 2004 brought Babafemi Taiwo, MBBS, '06 GME, onto the front lines of the global HIV/AIDS epidemic.

At that time, scientists had shown the disease was treatable, but only with a toxic cocktail of drugs with onerous side effects. Patients faced extreme stigma and often viewed their condition as a death sentence, explains Taiwo. So did their clinicians. The situation was even more desperate in resource-poor countries, where the disease was spreading rapidly.

Instead of deterring Taiwo, these difficulties and the prospect of making a global impact drew him to HIV/AIDS research.

"It was a field that was rapidly evolving, and there were many opportunities for progress to be made," he says.

Since then, Taiwo has built a reputation as a leader in international HIV/AIDS research and as a mentor at Northwestern, which he joined in 2005 as a fellow. Now, he hopes to bring his drive to tackle complex clinical problems to his role as chief of Infectious Diseases in Feinberg's Department of Medicine. In this position, he hopes to further Northwestern's reputation as a national leader in advancing infectious disease care and research, and to take on emerging issues in infectious diseases such as multidrug resistant bacteria.

TOWARDS A CURE

Taiwo notes that since his time in North Carolina, advances in HIV care have transformed the disease into a treatable chronic illness.

"We have come a long way: HIV can now be treated with a single tablet in most cases and the side effects are minimal if any," Taiwo says. "The questions shaping the field now have to do with whether we can use fewer drugs to achieve the same or better results; how to prevent new infections; ways to further protect patients from end organ injury from HIV; and ultimately how we can cure infected individuals."

His own research includes one of the "insidious consequences" of HIV infection — neurocognitive deficits. Prior to the existence of modern HIV regimens, many patients developed AIDS-associated dementia, explains Taiwo's colleague Frank Palella Jr, MD, '90, '92 GME, the Potocsnak Family C.S.C. Professor of Medicine. As treatments have improved, the signs of neurocognitive deficits in patients with AIDS have become subtler, but remain important for clinicians to manage, Palella says.

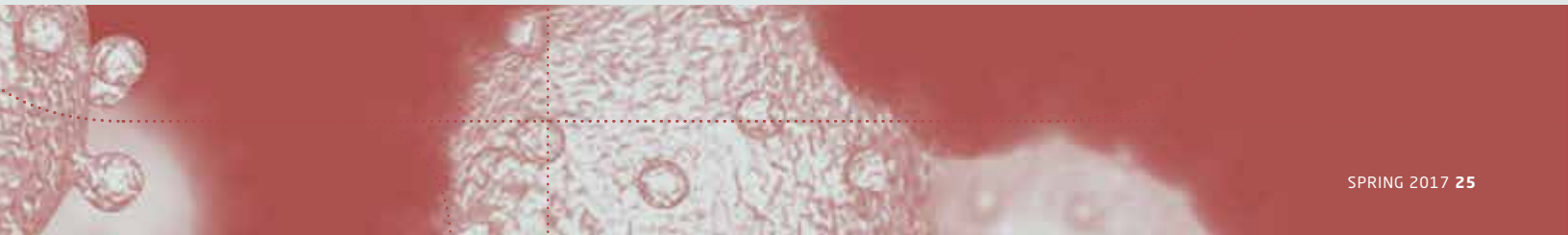
After infection, the HIV virus rapidly establishes itself in the brain, where it is protected from antiretroviral drugs by the blood-brain barrier. Finding ways to eliminate the HIV virus hiding in the brain is not only important for a patient's quality of life, Taiwo says, it is also vital to curing the disease. He explains that even if a cure was developed it might not be able to cross the blood-brain barrier, leaving the virus a place to hide.

"It may grandstand in the brain until we learn how to break into the blood-brain barrier without damaging it," he says.

To help address the ongoing spread of HIV in Chicago and beyond, Taiwo will continue supporting Northwestern's work through the Third Coast Center for AIDS Research (CFAR), a collaborative project between Northwestern, the University of Chicago, the Chicago Department of Public Health, the AIDS Foundation of Chicago, the Alliance of Chicago Community Health Services, and the Center on Halsted. A five-year $6.25 million grant from the National Institutes of Health helped get the project off the ground in 2015. A key goal for CFAR, led by co-directors Richard D'Aquila, MD, and Brian Mustanski, PhD, is facilitating research that can help end the spread of HIV in Chicago, particularly among men who have sex with men, a group that has experienced increased infection rates.

Beyond HIV/AIDS, Taiwo wants to incorporate genomics, proteomics and microbiomics into emerging infectious disease threats. For example, he'd like to use tools from these new disciplines to find ways to combat multidrug resistant gram-negative

> "We have come a long way: HIV can now be treated with a single tablet in most cases and the side effects are minimal if any."



bacteria, a growing concern in U.S. healthcare facilities, and to promote the development of rapid diagnostics.

Taiwo's energy, intelligence and openness when working with colleagues will help him meet these ambitious goals, Palella says.

"He has an enthusiasm that is extremely motivating," Palella says.

BRIDGING THE DIVIDE

Another asset Taiwo brings to his new role is international perspective. He grew up in Nigeria and studied medicine at the University of Ibadan, the country's premier medical school. He later completed a residency at Berkshire Medical Center in Western Massachusetts and began working as an internal medicine specialist at Duke University and its HIV Clinic. Taiwo's HIV/AIDS research since then has spanned both the U.S. and Africa.

He noted that his medical training in Nigeria was rich in didactic and clinical training, but included only limited exposure to advanced diagnostic technologies, something he was able to catch up on during his U.S. training.

"The combination of both has proven to be uniquely valuable," he says.

Understanding the strengths and weaknesses of both systems has aided his research.

"He understands the challenges and limitations of conducting research in resource-poor settings and is resourceful at developing solutions," Palella says.

For example, the technological gap between the U.S. and Nigeria "extends into the research arena and has become more acute given accelerated advances occurring in the U.S.," notes Taiwo. "This gap continually impacts my research and training associations with Nigeria, as the accessible research methodologies are different between these worlds."

These gaps also create opportunities for major advances, since many technologies have yet to be applied in Nigerian studies.

"The limited application of advanced methodologies to research in places like Nigeria to date means tremendous opportunities exist for game-changing discoveries and innovation that will improve the lives of millions of people," he says.

Taiwo also sees opportunities for bilateral exchanges between investigators and clinicians in different settings. He has worked to help train clinicians and investigators in Nigeria and to promote opportunities for shared knowledge. For example, inexpensive diagnostic tests developed in Nigeria might also be useful and cost-effective in the U.S.

"That cross-fertilization is important, and I really try to take advantage of it," he says.

Palella says he expects Taiwo to push the Division of Infectious Diseases to collaborate more and to take on difficult projects.

"I think we will be even more outward-looking now," Palella says. "That's good for us as a division and for the providers, patients and nations we collaborate with."

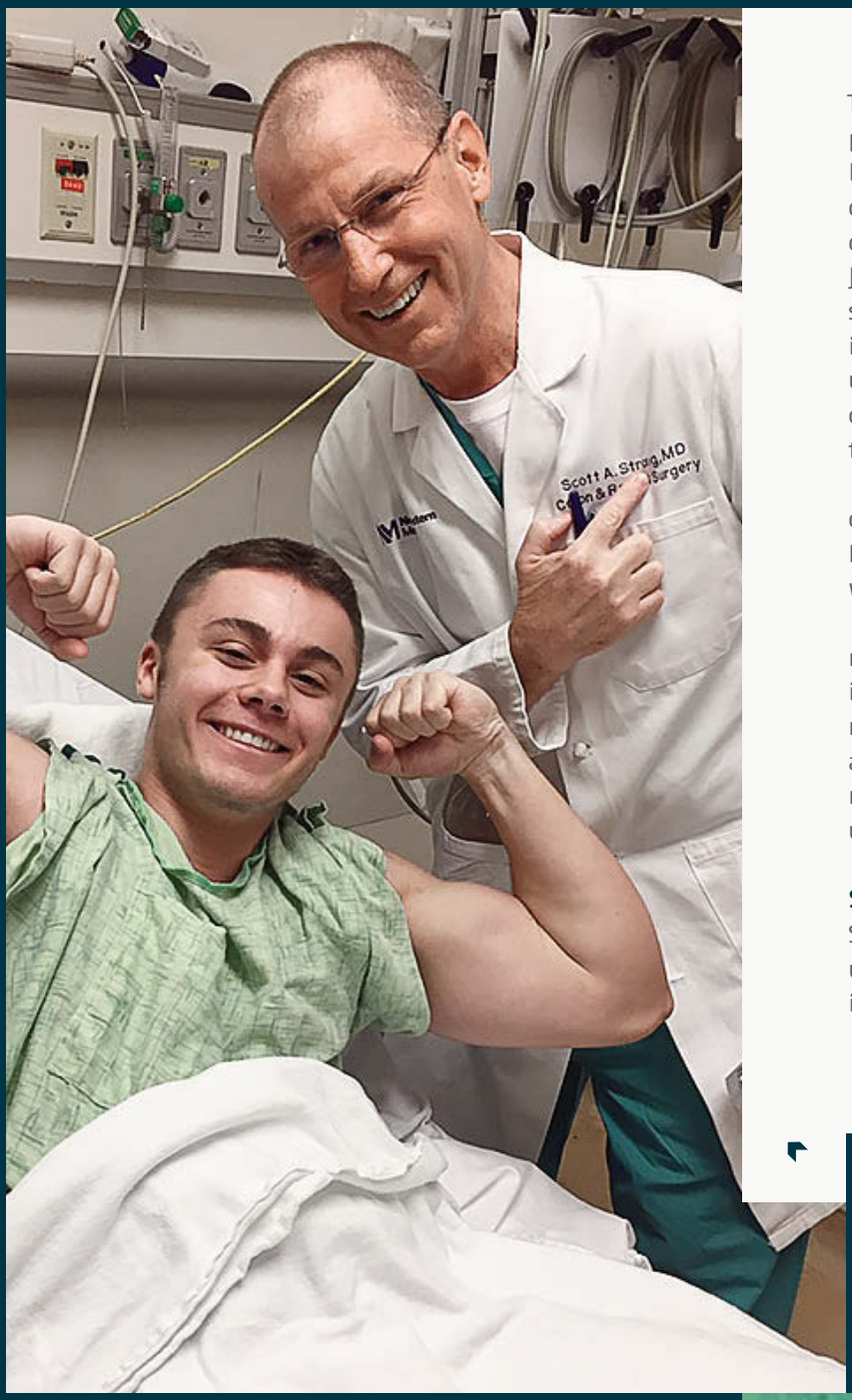
Taiwo adds, "Through working with others, we can always find ways to do more for each other, our institutions and humanity." NM

> "Through working with others, we can always find ways to do more for each other, our institutions and humanity."

Multidisciplinary teamwork saves patient's life

WRITTEN BY: Cheryl SooHoo

STRENGTH IN NUMBERS



Josh Szymanek with his colorectal surgeon Scott Strong, MD, surgical co-director of the Northwestern Medicine Digestive Health Center.

The rare catastrophic medical event often has no playbook. A medical center able to rapidly deploy the best minds to an uncommon situation can mean the difference between life and death for a patient. No one appreciates this capability better than 19-year-old Josh Szymanek. Several days after undergoing elective surgery at Northwestern Memorial Hospital to treat his inflammatory bowel disease (IBD), he developed a highly unusual complication that almost cost him dearly. Blood clots had blocked vital blood flow involving his intestinal tract and into his liver.

"If I had gone to another hospital for my surgery, I definitely wouldn't be here today," says the Northern Illinois University sophomore. "Northwestern Medicine is where you go if you want to get the job done right."

A year ago during the New Year's holiday weekend, a multidisciplinary team of Northwestern Medicine specialists dramatically reconfirmed that the teenager had made a good choice. Faced with an extensively clotted abdominal venous system, the likes of which they had never witnessed, these experienced clinicians quickly used their skills and expertise to save Szymanek's life.

SEEKING A CURE

Szymanek had dealt with the debilitating effects of ulcerative colitis since the seventh grade. Driven by intestinal inflammation, the chronic disease causes a

variety of symptoms, including abdominal pain, bleeding stool and frequent diarrhea. A patient of the Northwestern Medicine Digestive Health Center, Szymanek had tried all the drugs available to manage his IBD, but to no avail. They either stopped working or didn't work at all.

"Medical therapy is the first line of treatment for ulcerative colitis," says Szymanek's gastroenterologist Stephen Hanauer, MD, the Clifford Joseph Barborka Professor of Medicine and the center's medical co-director. "When patients don't respond to the whole gamut of medications, we then recommend surgical removal of the colon."

Enter renowned colorectal surgeon and the center's surgical co-director Scott Strong, MD. Specializing in IBD, Strong has performed several hundred restorative proctocolectomies with ileal pouch-anal anastomosis procedures. The closest to a "cure" for ulcerative colitis, the multiphase operation involves removing the large intestine (colon and rectum) and creating an internal pouch to collect stool that will eventually pass through the anus. The procedure allows patients to have close-to-normal bowel movements rather than a permanent external ileostomy bag.

"If I had gone to another hospital for my surgery, I definitely wouldn't be here today,"

— Josh Szymanek

"The colon is usually the problem for people with colitis," says Strong, the James R. Hines, MD, Professor of Surgery and chief of Gastrointestinal and Oncologic Surgery. "By removing the entire large intestine, our goal is to get patients off medications for good."

Ready to start living a life free of constantly scoping out restrooms, Szymanek underwent part one of his three-part surgery on December 29, 2015. The routine laparoscopic surgery went well. By day two, Szymanek was walking the hallways and looking forward to going home to Tinley Park, Illinois. Then his vital signs crashed.

"Josh said he was losing feeling in his abdomen and legs," recalls his mother, Jennifer, a registered nurse with 28 years' of hospital experience. "He was bottoming out. He became extremely ill very fast."

MONSTER BLOCKAGE

Imaging tests revealed blood clots in Szymanek's superior mesenteric and splenic veins and ultimately, portal vein. These conduits all drain blood from the gastrointestinal system into the liver for detoxification. "Imagine a tree with branches," Strong explains. "Josh had clots in the smaller branches leading into the trunk or portal vein."

To make a bad situation even worse, Szymanek also had developed a rare clot in his superior mesenteric artery, which supplies oxygenated blood directly to the intestines. In short, his intestinal tract could not get rid of or receive any blood flow, and he was quickly going into organ failure and possible death.

Late in the evening of his fourth day in the hospital, Szymanek was transferred to the intensive care unit and started on

A DRAMATIC TURN OF EVENTS

1

12/29/2015

Szymanek undergoes the first of three surgeries to remove his colon and treat his ulcerative colitis.

2

12/30/2015

After the routine laparoscopic surgery, Szymanek's vital signs crash unexpectedly.

a standard anticoagulant therapy. Several hours later, it was clear that the blood clot-busting drugs were not working. It was a dire situation that called for innovative thinking. Fibrinolytic therapy — delivering blood thinning thrombolytic drugs via catheter directly into the vein — came to Strong's mind, even though the procedure is typically performed to break up acute pulmonary embolisms in the lung. So he called in the interventional radiology (IR) team. Recalls Strong, "We discussed using the therapy but then they said, 'We have something better.'"

CREATIVE PROBLEM SOLVING

In his 30 years at Northwestern, interventional radiologist Robert Vogelzang, MD, '77, '81, '82 GME, had never before encountered such clotting in a patient with a seemingly healthy liver. But it didn't matter. Vogelzang, the Albert Nemcek Professor of Interventional Radiology Education and former chief of Interventional Radiology, knew how to remove clots using minimally-invasive endovascular techniques. And he worked with livers all the time, performing advanced liver interventions — albeit usually in patients with liver failure due to disease.

Vogelzang began with a catheter-based procedure routinely used to alleviate portal vein hypertension known as TIPS (transjugular intrahepatic portosystemic shunt). He gained access to the portal vein through a vein in Szymanek's neck and inserted a stent into the liver. By creating a pathway into the venous system, the IR team manually pulled out the clots blocking blood flow to the organ.

Stephen Hanauer, MD

Robert Vogelzang, MD, '77, '81, '82 GME

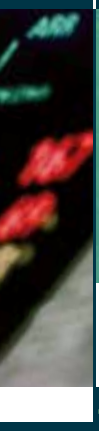
Matthew Potts, MD

In the meantime, Matthew Potts, MD, assistant professor of Neurological Surgery and an expert in neurointerventional methods, assisted with removing the clot in the mesenteric artery. Potts used a device normally employed for removing blockages in cases of acute ischemic stroke. By the end of the six-hour procedure, the IR team had restored blood flow in and around Szymanek's liver.

"Josh was in the right place with the right people ready to help him," Vogelzang says. "We combined all the things we know how to do to come up with an outside-of-the-box solution for him. It's this type of collaboration and expertise that exists in spades at Northwestern Medicine and allows us to treat patients the best way we can."

On December 15, 2016, Szymanek underwent the last of the three surgeries for his ulcerative colitis. A weight lifter who lives for going to the gym, he's feeling better every day.

"Every time I got sick from my colitis, I would have to stop working out," he says. "Now I can finally get back into it without any setbacks moving forward."



3

1/1/2016

Tests show rare blood clots in vital veins and arteries in Szymanek's gastrointestinal system, a situation that will lead to organ failure without action. Szymanek is transferred to the ICU and put on anticoagulant drugs. They don't work. Interventional radiologists (IR) are called in. They come up with an innovative plan to manually pull out the clots.

4

1/2/2016

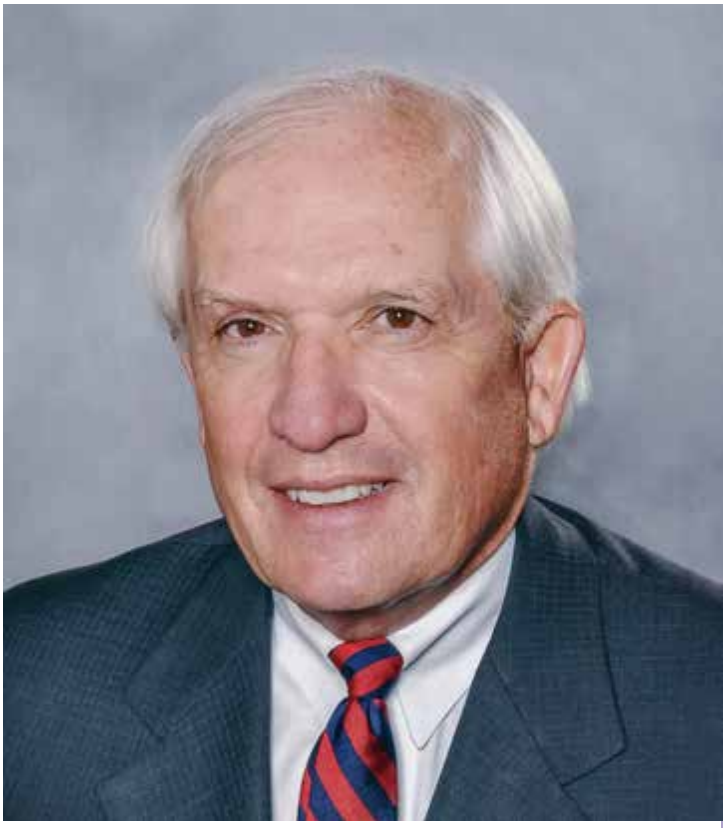
After a six-hour procedure, the IR team restores blood flow in and around Szymanek's liver.

5

12/15/2016

Szymanek completes the last surgery for his colitis without complication.

Alumni President's Message: Introducing a New MAAB President, Jim Kelly, '73 MD



Dear Fellow Alumni:

I am indeed honored to accept the gavel as the 14th president of our Medical Alumni Association, begun in 1991. First, let me say thanks to Bruce Scharschmidt, '70 MD (HPME), for his outstanding leadership as we transition from an elected to an appointed Medical Alumni Association Board (MAAB).

Many thanks also to the previous presidents of the MAAB — Walter Doren, '61 MD, '66 GME; David Sanderson, '58 MD; Kenneth Viste Jr., '66 MD, '70 GME; Richard Heller, '63 MD; Howard Traisman, '47 MD; Andrew Bunta, '67 MD, '74 GME; Susan Rayner; Walter Huurman, '62 MD; Bonnie Typlin, '74 MD; Douglas Carr, '78 MD; Jimmy Hill, '74 MD, '79 GME; and David Winchester, '63 MD, '70 GME — who laid the groundwork for this organization's successes. Many thanks to our former Medical Alumni Association directors, Ginny Darakjian and ML Farrell, and to our current director, Babette Nyka. They have always gone above and beyond while working for our organization.

Through Bruce's leadership and the support of Dean Neilson and our fantastic MAAB staff, we are transforming and diversifying our alumni board as we continue to explore opportunities in four major areas: philanthropy, engagement, mentoring and strategic initiatives. Leveraging the strengths of our MAAB, we are continuing to look for new initiatives to engage our alumni worldwide.

I want to share with you a bit of my background. I graduated from the medical school in 1973 and have been a member of the MAAB for eight years. I pursued a residency in general surgery followed by a fellowship in cardiothoracic surgery at The Barnes Hospital/Washington University School of Medicine. I spent two and a half of my nine years at that medical school doing research for the Howard Hughes Professor of Medicine and Immunology, Charles Parker, MD.

In 1982, I took a faculty position at the Tulane University School of Medicine as an adult and pediatric cardiothoracic surgeon with a laboratory interest in pulmonary hypertension and cardiac myocyte energy metabolism. In 1986, I pursued a private practice in adult cardiothoracic surgery in South Bend, Indiana.

I received an MBA from Northwestern's Kellogg School of Management in 2007 while still continuing a clinical practice, thanks to my top cardiothoracic surgery partner-surgeons. As I finished my MBA, I started an LLC, Cascade Partners, to help mentor, advise and invest in early stage disruptive, innovative medical/surgical processes and technologies. Remote technology management of chronic disease is my ongoing interest. Currently, I work at MATTER, a biomedical/life science technology incubator in Chicago, and I am a member of Chicago Innovation Mentors. I have worked at biomedical/life science incubators at Washington University, Northwestern University, University of Chicago and the University of Notre Dame. My wife, Christine, and I have four children, one a graduate of Northwestern University.

> "I hope that, during my tenure, we can forge an exciting story about alumni support for evolving academic excellence and a debt-free medical education."

I joined the MAAB because it is clear that the trajectory of Feinberg and the Northwestern Medicine health system is rapidly changing locally and nationally. Dean Neilson has committed to attracting top academic talent, and he is expanding the research facilities on the medical school campus. He has assembled a very

effective administrative team and is putting more resources into the Development and Alumni Relations team, led by Alan Krensky, MD, which supports the MAAB.

One reason I decided to join the board is the focus on fundraising to provide full-tuition support to all Feinberg students. Last year, the average medical school education debt for a Feinberg graduate was $185,000, compared to the national private medical school average of $203,000. It is clear that, due to this financial stress, Feinberg graduates are being forced to make important career decisions with an eye on debt repayment rather than passion.

In Northwestern's last fiscal year, Feinberg alumni gave $3,106,090 in support of scholarships at the medical school, bringing us ever closer to our scholarships endowment goal of $800 million. For three years running, every member of the MAAB has made at least one annual gift to the medical school. The Development and Alumni Relations staff also hit a 100 percent giving participation goal this past year. You can see that we are truly creating a culture of philanthropy where participation at any level is paramount.

I would like to double down our efforts to engage our medical students and reach out to our alumni for their help as we continue to build a cohesive and supportive network. I hope that, during my tenure, we can forge an exciting story about alumni support for evolving academic excellence and a debt-free medical education.

Our efforts in engagement continue to grow as we expand our Alumni Physicians of Feinberg program and look for new ways to engage our GMEs. Our Strategic Initiatives Committee has seen increasing diversification within Global Health and Physicians in Business. A new Women in Medicine event with an expert panel and networking occurred during Alumni Weekend. In addition, our Mentoring Committee has also built a bridge to our medical students, and its role is expanding.

Magnifying our mentoring efforts by linking with the Augusta Webster, MD, Office of Medical Education, we have added Diane B. Wayne, '91 MD, to an ex-officio position on the MAAB, and Emily Jones, '08 MD, '11 GME, to head our mentoring efforts. The Northwestern Network Mentorship Program cultivates meaningful mentoring opportunities for student and alumni mentees as they navigate their medical careers. The HOST Program (Help Our Students Travel) helps offset the financial burden and stress placed on fourth-year medical students when they interview for residencies across the country, and is a great way for our alumni and medical students to connect.

I am honored to serve all graduates of the medical school programs: MD, PT, MPH, GME, fellowship and beyond. My goal is to expand efforts to engage alumni and to utilize their talents to form a more active relationship with the health system and medical school. I solicit your ideas to help us move forward.

Sincerely,

Jim Kelly, '73 MD

KELLY AND CURRENT MEDICAL STUDENTS AT A RECENT "ALUMNI PHYSICIANS OF FEINBERG" DINNER.

Progress Notes

More details from our alumni online at *magazine.nm.org.*

'50s

Paul J. Rosen, '51 MD, recently turned 90 and would like to hear from any of his classmates. He lives in Sacramento, Calif., and says he "...would be especially appreciative to hear from any old timers who live near me."

Gerson Bernhard, '53 MD, '59 GME, is a regular attending in the rheumatology clinic, supervising fellows at the University of California-San Francisco. He says, "They teach me the hot new stuff, and I provide historical perspective and help with the art of medicine. I have also been engaged as a volunteer doing tele-consultations and seminars for a non-profit MAVEN project. Recently I had the pleasure of talking to another classmate, William "Bill" Johnson, '53 MD, who lives in a retirement complex in Medford, Ore. He was well, alert and engaged. I hope to see him when we go to Ashland for theater in April."

Lawrence "Larry" Linder, '56 MD, writes, "My wife, Joan, and I have moved from Cincinnati to a retirement community, Freedom Village Brandywine near Philadelphia, to be closer to our children. It has been quite an adjustment, but it's a good facility with a lot of interesting, nice residents. Drop us a line, or give us a call, we'd like to hear from you." (484-288-2296, larrylinder526@gmail.com)

William "Bill" Ziering, '56 MD, has been participating in triathlons since the early 80s. He says, "I can't remember ever finishing in the top half and have had lots of bike falls and crashes. I still managed to be the Age Group World Champion in Chicago in 2015. I am now ranked number one for the age group 85-89 in California."

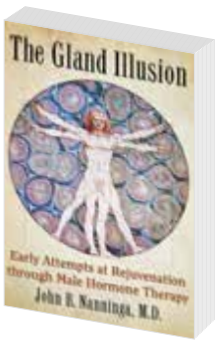
Ziering belongs to the Triathlon Club of Monterey. His favorite triathlon distance is Olympic, and he is participating in several 2017 USAP triathlons. His favorite saying is: "Start off slowly then ease up!"

'60s

Michael J. Moore, '62 MD, writes, "Since our last medical school reunion, Ellen and I continue to enjoy excellent health. I retired as clinical professor of Neurology at Boston University School of Medicine in 2011, but continue to teach weekly seminars for the third- and fourth-year medical students. These bright young people are a great stimulus for me to keep up with all the new developments in the field, and they are a pleasure to be with. In addition, I will be starting my 45th year in the private practice of Neurology at Emerson Hospital in Concord, Mass., but I've cut back to half time with no more emergency department coverage.

Ellen and I continue to appreciate our cottage at Deer Isle, Maine, in the summer. Our son Chris, a radiologist, his wife Michele and both grandsons join us there for one or two weeks every summer. We continue to day sail in the Gulf of Maine, Eggemogin Reach, East Penobscot Bay and Jerico Bay aboard our sloop, Viceroy.

We visit our condominium in Naples, Fla., at least twice a year during the winter months, and enjoy meeting with old friends from Iowa, Boston and even Deer Isle — some visiting and some who own vacation homes. Our best regards to the medical class of 1962."



John Nanninga, '63 MD, '70 GME, recently authored a book titled "The Gland Illusion," published by McFarland & Company. The book explores the early history (late nineteenth to early twentieth century) of the discovery of glands and their use in rejuvenation. The subject matter focuses

on the use of the sex glands and how they might make a person younger. Despite the pseudoscientific nature of the practices, the work was a stimulus to the eventual discovery and use of testosterone and estrogen.

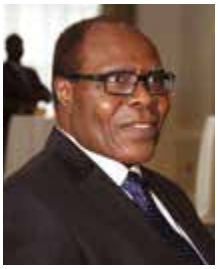
Robert Young, '66 MD, of Pueblo, Colo., is a board-certified orthopedic surgeon in private practice and clinical associate professor of Family Medicine at University of Colorado School of Medicine. In October, he entered the Pueblo Central High School Hall of Honor. A former Eagle Scout, Young has been active in the Boy Scouts of America for 35 years and runs the Eagle Scout board of review program for the district. He received the District Award of Merit and the Silver Beaver Award, the highest awards to an adult volunteer. Young is also a volunteer senior health insurance information program counselor.

Michael L. Friedman, '67 MD, received his commission in the U.S. Navy in 1964, while attending medical school at Northwestern. Freidman writes, "I am still practicing medicine in California and will always remember my days at NU and with the Navy. We took care of the Marines from Vietnam, who we affectionately called grunts, and they called us swabbies."

His daughter delivered her twins 14 years ago at Northwestern Memorial Hospital and also obtained her PhD in psychology from Northwestern.

C. Ray Zeiss, '67 MD, '70, '72 GME, and his wife attended the World Allergy Association/Allergists for Israel conference in Jerusalem in December 2016, where Zeiss gave a presentation on occupational immunologic lung disease. The meeting included tours of many beautiful, historic parts of Israel.

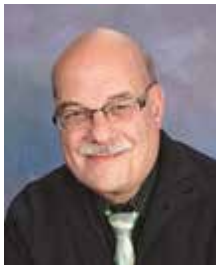
Ferdinand Ofodile, '68 MD, received the 2017 Lifetime Achievement Award from the New York Regional Society of Plastic Surgeons. In 2015, he retired from the practice of plastic surgery after serving as a clinical professor of Surgery at Columbia University and chief of Plastic Surgery at Harlem Hospital Center. He now serves as a clinical professor emeritus at Columbia.



Sheldon Rabin, '69 MD, is one of the founding members of Precision Biologics, a clinical stage biotechnology corporation focused on developing therapeutic and diagnostic products for the early detection and treatment of cancer. The company, formed in 2012, will work on basic technology for the Cancer MoonShot 2020 program.

'70s

Ralph Levitt, '73 MD, has been a clinical professor of Medicine at the University of North Dakota School of Medicine for the last nine years and co-director of clinical skills for two years. He is recently semi-retired from his clinical position as attending physician at the Roger Maris Cancer Center at the Sanford Health Center in Fargo, N.D., where he was on the staff for 37 years, previously serving as chairman of Hematology/Medical Oncology and principal investigator for the Community Clinical Oncology Program. He lives with his wife, Helen, in Fargo.



Elliot Francke, '75 MD, released his first novel, "Upon a Time - the Darkness behind the Tales." It is a historical fiction/murder mystery based on prototypes for many fairy tale characters, with a theme of how such stories might have developed. It also highlights the effects of abuse not only on individual lives, but also on society as a whole. The book is available in print and e-book format at www.elliotfrancke.net or on Amazon.

Francke is also developing the Antimicrobial Stewardship Program for the Waconia Ridgeview system in Waconia, Minn.

Richard Ferkel, '77 MD, released the second edition of his textbook, "Foot and Ankle Arthroscopy," in November 2016. His son, Eric Ferkel, '08 MD, now practices with him at the 40-physician Southern California Orthopedic Institute. Richard and Michelle are enjoying their two young grandchildren, who were born one month apart.

'80s

David H. Watt, '80 MD, received the 38th Annual Northwestern Medicine Martin Luther King Humanitarian Award for extraordinary contributions to the community and for embodying Dr. King's legacy

DAVID H. WATT, '80 MD (THIRD FROM LEFT), WITH FELLOW RECIPIENTS OF THE 38TH ANNUAL NORTHWESTERN MEDICINE MARTIN LUTHER KING HUMANITARIAN AWARD.

of humanitarianism. Watt was recognized for more than 30 years of international and local volunteer work.

Watt took his first medical mission trip while he was studying to become a doctor at Feinberg. His volunteer work, including with the group MedSend, has taken him around the globe to places like the Ivory Coast, China and Mexico. He also has found ways to contribute at home, serving his community through volunteering as a team physician, providing free surgeries to international patients in need, mentoring students and, with his wife, donating an anatomy lab to Wheaton College. After 30 years of providing orthopaedic care to Chicago's underserved West Side, Watt retired from his volunteer position at the Lawndale Christian Health Center in 2016.

Steven Isono, '82 MD, of Berkeley, Calif., is an orthopedic surgeon specializing in sports medicine. He is the team physician for the NBA's Golden State Warriors and multiple U.S. Olympic teams. He covered the Olympic Games in Rio de Janeiro in summer 2016 and the Pan American Games in Toronto in July 2015.

Benjamin Kanter, '82 MD, '85 GME, previously with Extension Healthcare, has joined Vocera Communications as chief medical information officer.

Bob Bielski, '85 MD, was in the bleachers when the Cubs beat the Dodgers to finally go to the World Series. Dave Walden, '85 MD, flew in from Colorado the night before to see the game as well. Luckily, they ran into each other in the bleachers and had a mini reunion.

Grace Downing, '85 MD, writes, "Nothing has changed except I'm enjoying retirement."

Greg Kalemkerian, '85 MD, '88, '89 GME, is a professor of Medicine and associate division chief for faculty development and education in the Division of Hematology/Oncology at the University of Michigan. He recently served as the lead editor for the "Handbook of Lung Cancer and other Thoracic Malignancies." His wife, Mary Varterasian, MD, '90 GME, built the successful consulting firm, Ann Arbor Drug Safety, which is involved in all phases of clinical drug development. Greg and Mary live in Ann Arbor, Mich., with their two teenage sons.

Todd Engstrom, '86 MD, joined Sansum Clinic as an internist.

Jordan H. Perlow, '86 MD, completed serving as the division director of Maternal-Fetal Medicine at Banner University Medical Center and is a clinical professor of Obstetrics and Gynecology at the University of Arizona College of Medicine - Phoenix. He is in his 25th year of maternal-fetal medicine practice with Phoenix Perinatal Associates.

He writes, "I have three beautiful grandchildren, two of whom live overseas in Jerusalem, and one in Orange County, Calif. I am looking forward to retiring from weekends, 24-hour hospital shifts and night call this year, but otherwise am maintaining a full workload of clinical bedside practice! My wife, Ana, is from Rio de Janeiro, and we travel there annually to enjoy both the excitement and the relaxation of that beautiful city. I go fishing each year up into the Northwest Territories of Canada with my father, who will turn 87 this year. Hiking, swimming, weightlifting, photography, travel and reading are my pastimes. It is amazing how many children of very sick mothers, that I delivered years ago, contact me on Facebook to express their gratitude. I have not regretted a single day of my wonderful career. Northwestern University Medical School will always hold a special place in my heart for giving me the opportunity to pursue my dreams!"

Wayne Saville, '86 MD, married Laura Silverstein Colban of San Diego, on July 20, 2015.

Scott Zeller, '86 MD, released a new textbook, "The Diagnosis and Management of Agitation," published by Cambridge University Press. The book debuted in January and became the #1 hot new release for mental health textbooks on Amazon, as well as a top seller in the emergency medicine category.

MARY VARTERASIAN, MD, '90 GME, AND HUSBAND GREG KALEMKERIAN, '85 MD, '88, '89 GME.

Neelofur R. Ahmad, '88 MD, joined the faculty of the University of Texas MD Anderson Cancer Center as an associate professor of Radiation Oncology. She was previously in private practice in Houston for 18 years. She will now be practicing in MD Anderson's Bay Area Regional Care Center.

'90s

Brian J. Bear, '91 MD, was named one of Castle Connolly's "Top Doctors 2017." Since his election in 2000 as president of OrthoIllinois, the practice has grown from eight physicians and 50 support staff to 32 physicians and over 400 staff. It now includes four clinical facilities, an ambulatory surgery center, a research department, a cadaver training lab and serves as a training site for orthopedic residents, medical students, family practice residents and physician assistants.

Mehdi "Matti" Vazeen, '92 MD, a Carson City, Nev., ophthalmologist, traveled to Bangladesh in March for two weeks. There, he performed charitable cataract surgeries at Bangladesh Eye Hospital and lectured beginner surgeons about cataract procedures at the Ispahani Islamia Eye Institute. He introduced an updated version of his textbook to the seminars as a part of his established teaching exchange program. His goal was to help enhance training and increase capacity at these institutions, on top of conducting 50 free surgeries at the hospital. He travels to pursue charitable work every few years.

Because of his commitment to altruistic work and to his patients around the world, Nevada U.S. Senator Dean Heller — also a longtime patient — recognized Vazeen in November. In the tribute, Heller describes Vazeen as a figure who "exemplifies the highest standards of leadership and should be proud of his hard work that highly benefits many Nevadans" and is "a true example of someone who has spent many years dedicated to the Silver State."

Vazeen is very busy in his hometown as well: He and his staff have performed at least 20,000 surgeries in the Carson City area. He is a first-generation eye doctor in his family and also is involved with the American Academy of Ophthalmology and the American Society of Cataract and Refractive Surgery. He is married to Ashley Vazeen, a nurse practioner at Carson Surgical Group. They have two children, Cameron and Isabella.

In August 2016, Will Harper, '95 MD, opened a private internal medicine practice, Harper Health, back "home" in the shadow of Northwestern at 737 N. Michigan Ave. He invites his classmates to come by and say hello!

Jamie Loggins, '96 MD, medical director of Central Maine Bariatric Center and chief of Surgery at Central Maine Medical Center, writes: "Hello Northwestern! Its been awhile since I graduated from medical school, but sometimes it seems like just yesterday that I was getting advice from Dean Snarr and TA'ing anatomy with Dr. Cochard. It's been a long journey since then, and I thought you might find the following interesting, especially as it may help to create awareness and better understanding of an epidemic disease!"

Loggins, an expert in robotic and laprascopic surgery, was working on a fellowship in minimally invasive and robotic surgery at University of California Davis - Sacramento, when he was recruited to build the bariatric center from scratch at Central Main Medical Center. He was in charge of designing the facility, obtaining equipment and choosing staff. Since then, Loggins has performed over 2,000 bariatric surgeries. In late 2016, he made headlines performing the procedure on Maine governor, Paul LePage, and his wife, first lady Ann LePage.

Erik K. Alexander, '97 MD, has been appointed director of Medical Student Education and the executive director of the Brigham Education Institute at the Brigham & Women's Hospital and Harvard Medical School.

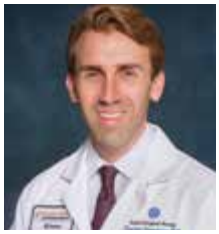
Mickey Y. Kim, '97 MD, director of partnering and strategy at MedImmune, has been elected to the board of directors at Virginia Bio, a non-profit representing the life science industry in Virginia.

Kevin J. Bohnsack, '98 MD, MPH, was recently appointed system chair for the Department of Family Medicine at Saint Joseph Mercy Health System, Ann Arbor, Mich. He is also a colonel in the Michigan Air National Guard and serves as commander of the 110th Medical Group in Battle Creek, Mich. As the class representative for the Class of 1998, he also hopes that everyone is saving the date for their 20th reunion!

'00s

Dave A. Rengachary, '00 MD, senior vice president and chief medical director of the Reinsurance Group of America, has joined the board of directors of the Memory Care Home Solutions.

The American Urological Association has selected James Michael Dupree, IV, '07 MD, '09 MPH, '13 GME, assistant professor of Urology at the University of Michigan at Ann Arbor, as the 2017 Gallagher Health Policy Scholar.



E. Charles Osterberg, '09 MD, recently accepted a position at the University of Texas Dell Medical School as assistant professor of Urology.

He completed fellowship training in genitourinary reconstruction at the University of California - San Francisco, prior to moving to Austin, Texas. He recently married Melissa Gerdung in Sonoma County, Calif.

LinkedIn named Usha Periyanayagam, '08 MS, '09 MD, '09 MPH, '13 GME, of San Francisco, director of research at Global Emergency Care, one of the "Top 10 Social Impact Professionals Under Age 35." Periyanayagam is an emergency medicine physician in Napa County and an affiliate faculty member of the Harvard Humanitarian Initiative. She has worked in more than ten countries around the world in emergency departments, rural primary health clinics and refugee camps. She is pioneering the use of bioinformatics and big data in addressing challenges in providing global healthcare. Global Emergency Care is a nonprofit health organization dedicated to increasing access to emergency care in low-resource settings.

'10s

Ali Habib, '15 MD, a resident in Radiology at the McGaw Medical Center of Northwestern University, attended CanceRx at the Massachusetts Institute of Technology last fall. The invitation-only conference brought together scientists, economists and other stakeholders to discuss new approaches to financing biomedical innovation. Read about his experience there online at *nm.magazine.org*.

GME

Paul Pasulka, MD, '83 GME, '85 PhD, of Chicago, is a clinical psychologist on faculty at the Feinberg. About ten years ago, he stumbled into a playwriting class, where he says he felt at home from the moment he hit the door. Since then he has written more than a dozen plays, including "Skin for Skin," which ran at Chicago's Rivendell Theatre from Feb. 28 to April 2.

James Wheless, MD, '88 GME, professor and chief of Pediatric Neurology at the University of Texas, has joined the Scientific Advisory Board of CombiMatrix Corporation.

Richard D. Zorowitz, MD, '89 GME, was promoted to professor of Clinical Rehabilitation Medicine at Georgetown University. He is an outpatient neurorehabilitation physician at MedStar National Rehabilitation Network in Washington, D.C.

Annabelle Santos Volgman, MD, '90 GME, McMullan-Eybel Chair for Excellence in Clinical Cardiology and medical director for the Rush Heart Center for Women, was granted the rank of professor in July 2011 and endowed chair in November 2014.

Jeffrey Altman, MD, '91 GME, is pleased to announce that after more than 20 years in private practice, he has joined Mercy Health at their Woodstock and Barrington locations to run the dermatology services on the Illinois side of their operations.

Bernard R. Canlas, MD '99 GME, recently joined the VA Puget Sound Health Care System to become the medical director of Pain Medicine at the American Lake Division in Tacoma, Wash. He was also appointed as the medical director of one of the few Commission on Accreditation of Rehabilitation Facilities-accredited outpatient functional restoration pain programs in the VA system and medical director of the only domiciliary-based residential functional restoration pain program in the United States. These unique programs have been a tremendous help to veterans suffering from chronic pain.

Canlas is acting assistant professor of Anesthesiology and Pain Medicine at the University of Washington School of Medicine in Seattle. He recently became a member of the editorial boards of the *Journal of Clinical Anesthesia and Pain Medicine* and the *Journal of Anesthesia and Intensive Care Medicine*.

Canlas writes, "Thank you so much to the Northwestern Family! I am so proud to be a part of it."

Aimee Caroline Smidt, MD, '08, '09 GME, associate professor at the University of New Mexico School of Medicine, has been named chair of Dermatology.

Gildasio S. De Oliveira, Jr., MD, '11 MS, clinical coordinator of Northwestern Memorial Hospital, was named chief of Anesthesiology at Lifespan, as well as head of Anesthesia at Lifespan Physician Group.

DDS

Roger Gertenrich, '62 DDS, of Portland, Ore., is a retired dentist and former mayor of Salem, Ore.

Sager provides medical care in a refugee encampment along the Syrian border in Northern Jordan.

The Physician's Privilege

WRITTEN BY:
JOHN SAGER, '91 MD

One of my earliest memories is hearing air raid sirens going off and enthusiastically running for the trench in the back of my house. As an eight-year-old kid, it was all fun and adventure: Indian jets racing overhead, bomb blasts and war. The fact that my parents had different expressions bothered me some, but didn't subtract from the excitement of the situation.

That was 1971 in Lahore, Pakistan. We were living on a hospital compound where my father worked as a medical missionary with United Christian Hospital. The hospital buildings had large red crosses painted on the roofs to prevent them from being bombed by the Indian pilots. It worked for us, but the surrounding villages weren't so lucky. Invariably the injured would begin pouring in through our gates and the reality of the violence and brutality of the war would hit home, even to me. Later, those memories would have a significant impact on my decision to go to medical school and Northwestern.

What we do with our lives and how we respond to the situations that present themselves to us is of immense importance not just for each of us, but for our families, friends and entire communities. As physicians, every one of us with rare exception, is positioned to be of service when the need arises. However, the need doesn't need to arise; it is always there and in great abundance. So often, students apply to medical school because they want to serve others, usually in inner cities, overseas or in other disadvantaged settings. What happens to that calling over the subsequent years?

One of the great privileges we have as physicians is to be of service to people — especially those sick, marginalized, poor, injured or desperate. There are very few vocations that offer the opportunity for this. It's common to think that we are the ones sacrificing time, effort and money in these endeavors when, in fact, it is to our immense benefit. St. Francis of Assisi said that the beggar is there not solely for his benefit but for our own, so we may have the opportunity to show compassion.

Like many of you, I have volunteered throughout the years. Most recently I committed to helping Syrian refugees. Since 2013, I have traveled a few times a year to the Middle East and Greece to provide medical care to these unfortunate people. My group works in established refugee camps and, more commonly, along the Syrian border in towns and fields, wherever there are people needing help who do not have ready access to healthcare. Sometimes that is in a dusty field and other times in a Bedouin tent. At the end of the week, we will have seen well over a thousand people, mainly women and children.

The situation in Syria and the plight of its people is one of our modern age's great tragedies. What I do during these weeklong trips seems so infinitesimally small compared to the big picture. I think of Mother Teresa explaining that you can only treat one at a time and that is all. But for that one person, it is enough. And I come back to my private practice in Oregon rejuvenated and energized, feeling that I again experienced the essence of what it means to be a physician in the most basic terms, free of electronic medical records, paperwork, insurance questions and schedules.

After an especially long and tiring day seeing literally hundreds of women and children in one of our clinics, I sat down on a wooden bench. I let my eyes close and felt the exhaustion seep into my bones. A few minutes had passed when I felt a small tap on my knee. When I opened my eyes I saw a small boy looking at me with a smile on his face, his grandmother standing in the background. I recognized him as one of my patients from earlier that day. After our eyes met, he gave me a hug. It's a hug I will never forget: a small Syrian refugee boy in a war-ravaged land showing compassion and comfort to me, of all people.

It is why we do what we do. We cannot forget why we chose to be physicians. We need it. Our world needs it. Now more than at any other time.

Fighting Bacterial Pathogens

WRITTEN BY:
BOB KRONEMYER

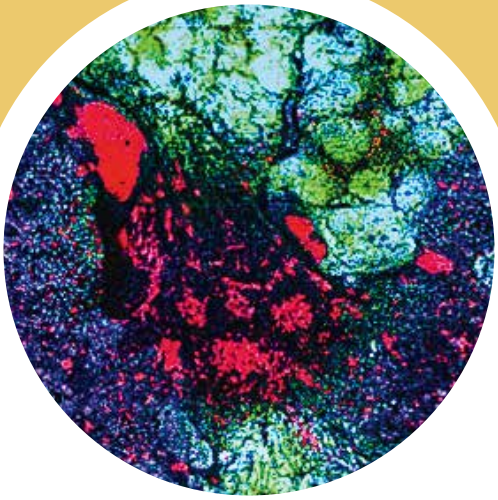
Just like the contagious nature of the diseases he studies in his laboratory at Vanderbilt University Medical Center, Eric Skaar, '02 PhD, '02 MPH, finds the enthusiasm of his trainees infectious. "I really enjoy the energy and excitement of working with young, intelligent and ambitious people," he says.

Currently, Skaar supervises a full-time staff of 22, consisting of MD and postdoctoral fellows, graduate students and research technicians, plus a part-time undergraduate student. Together, they investigate infectious diseases, with an emphasis on the intersection between nutrition and infection. Skaar says he enjoys this area of research because, "I love to solve puzzles."

That devotion translates into toiling roughly 70 hours a week in a 3,000-square-foot facility on the fifth floor of the largest building on Vanderbilt's campus in Nashville, Tennessee. "We are interested in how bacteria acquire food when they are in our bodies and how our bodies try to keep that food away from bacteria as a way to protect against infection," he explains.

The Skaar Laboratory, started in 2005, also explores how bacterial pathogens that cause disease compete with normal healthy bacteria in the body to acquire food, as well as how diet impacts these processes. "Someone's diet is an indicator of whether he or she is susceptible to bacterial pathogens," Skaar says.

Last year, his lab published a paper in *Nature Medicine* demonstrating that excess



LIPID ANALYSIS OF A MOUSE KIDNEY POST INFECTION WITH S. AUREUS BACTERIA GIVES SKAAR'S LAB MOLECULAR INFORMATION ABOUT INFECTION. THIS DATA WAS COLLECTED USING MALDI IMAGING MASS SPECTROMETRY.

zinc in the diet can dramatically increase susceptibility to Clostridium difficile infection, which is the major cause of antibiotic-associated diarrhea. In 2008, Skaar's team identified proteins produced by human immune cells that bind nutrient manganese and zinc "as a way to inhibit bacterial growth and protect people from infection."

Skaar, 42, grew up in Naperville, Illinois, where in high school he enrolled in an advanced placement biology course. "I became very interested in microbiology," he says. "I was amazed by the level of destruction and the rapid speed with which small organisms can cause damage to the human body. As I became more familiar with molecular biology, I became interested in the molecular processes that are responsible for disease."

Skaar's fascination with microbiology resulted in an undergraduate degree in bacteriology from the University of Wisconsin-Madison in 1996. Later that year, he began pursuing advanced dual degrees in public health and microbiology/immunology at the forerunner of Feinberg's Driskill Graduate Program in Life Sciences. Skaar chose Northwestern for two reasons: its strong microbiology/immunology department with professors who had research interests that mirrored his own, and the integrated graduate program. "I was given exposure to a lot of disciplines," he says.

Because Skaar was intrigued by molecular epidemiology and the possibility of training in public heath, he successfully petitioned Feinberg to allow him, as a PhD student, to also enroll in the part-time master's degree in public health for medical students. In fact, Skaar says he became the first student of what eventually became a formal dual-degree PhD and MPH program. He credits his graduate advisor, Hank Seifert, PhD, for unfailingly supporting his pursuit of the hybrid degree.

"The integrated graduate program prepared me for success by providing a truly diverse training background and encouraging me to think more broadly than my own field," Skaar says. "In my research, this has been a real advantage for me."

The dual training at Feinberg also shaped Skaar's interests and the kinds of questions he asks as an independent investigator. Following graduation in 2002, Skaar did three years of postdoctoral training in microbiology and chemistry at the University of Chicago, where he studied Staph infections.

Skaar accepted his first faculty position at Vanderbilt University in 2005, as an assistant professor of Microbiology and Immunology. He has since advanced to become the Ernest W. Goodpasture Professor of Pathology.

The Skaar Laboratory continues to discover how bacteria acquire nutrients during infection. "We feel that if you could stop bacteria from eating, you would have good targets that could be drugged as a way to develop new treatments for antibiotic-resistant bacteria," Skaar proposes. Mouse models in his lab have already demonstrated small molecules or drug candidates that can target some of these processes and protect the animal from infection.

"We are at the point now where we are discussing potential partnerships with larger pharmaceutical companies, so we can begin to advance some of these molecules into clinical trials," Skaar says. "It is not impossible that we could have molecules in clinical trials within one or two years." These could come in the form of an oral or topical antibiotic for anyone diagnosed with a Gram-positive bacterial infection. "And because the molecules we have developed target proteins that are only in bacteria, the hope is that the molecules will be safe," Skaar says.

Skaar's limited time outside his laboratory is spent with his wife of 15 years, Heather, and his two daughters, ages 13 and 10. He also likes to exercise and play golf.

In Memoriam

Norton H. Agron, '61 DDS, of Miami, died Aug. 28, 2016.

Doris Aubry, '53 CERT, of New Orleans, died May 15, 2016.

Donald D. Bailey, '63 MD, of O'Neill, Neb., died Jan. 24, 2016.

Ruth Mendenhall Barrett, '49 MD, of Bloomington, Ind., died Dec. 27, 2016.

David R. Beckwith, '82 MD, of Susanville, Calif., died Jan. 23.

Surindar N. Bhaskar, '46 DDS, of Monterey, Calif., died Aug. 4, 2016.

Stuart Bisk, '57 DDS, of Rancho Palos Verdes, Calif., died Sept. 24, 2016.

James D. Brodersen, '61 MD, of Munster, Ind., died Nov. 4, 2016.

Howard Bruggers, '53 DDS, of Lafayette, La., died Sept. 30, 2016.

William J. Bryan, '53 DDS, '57 MS, of Allentown, Pa., died July 25, 2016.

Paul G. Bubala, '59 MD, of Lake Forest, Ill., died Jan. 18.

Helen Duggar Conwell, '47 MD, of Portland, Ore., died Dec. 30, 2016.

Jacob M. Eisenson, '50 DDS, of Littleton, Colo., died Aug. 3, 2016.

Jackson "Jack" K. Erffmeyer, '49 MD, of Galesburg, Ill., died Jan. 25.

Lawrence J. Franks, '69 MD, '72 GME, of Damascus, Ore., died July 16, 2016.

Harry B. Hill, '44 DDS, of Joliet, Ill., died Sept. 20, 2016.

Harris P. Hinderaker, '50 MD, of Willmar, Minn., died Aug. 25, 2016.

Robert J. Hye, '79 MD, of San Diego, died Feb. 22.

Robert O. Jones, '53 MD, of Pawley's Island, S.C., died Feb. 15.

J. Michael Kassenbrock, '86 MD, of Phoenix, died Sept. 25, 2016.

Douglas D. Kirk, '86 DDS, of Lawrenceville, Ill., died Sept. 4, 2016.

Robert A. Kreisberg, '58 MD, '62 GME, of Birmingham, Ala., died Aug. 21, 2016.

Kaleb A. Lane, '09 MD, of Lansing, Mich., died June 5, 2016.

Calvin R. Lantz, '45 MD, '50 GME, of Gig Harbor, Wash., died Jan. 24.

John S. Larsen, '60 DDS, of Mercer Island, Wash., died Sept. 8, 2016.

Richard H. Lee, MD, '74 GME, of Peoria, Ill., died Oct. 9, 2016.

John T. Legowik, '64 MD, of Orlando, Fla., died Feb. 3.

James T. Licking, '51 DDS, of DeKalb, Ill., died July 22, 2016.

Nirmal S. Mann, MD, '69 MS, '69 GME, of Davis, Calif., died Oct. 24, 2016.

Steven E. Markowitz, '71 DDS, of Boulder, Colo., died Sept. 23, 2016.

James Francis Morrell, '68 MD, of Carmel, Calif., died Jan. 1.

H. Allan Rankin, '56 MD, of Carrollton, Ga., died Oct. 4, 2016.

Robert W. Schlitts, '51 DDS, of Port Huron, Mich., died Oct. 6, 2016.

William A. Scott, '61 DDS, of Port Orange, Fla., died Sept. 15, 2016.

William G. Seliger, '46 DDS, of Honeyville, Utah, died Sept. 12, 2016.

Norman M. Simon, '55 MD, '63 GME, of Evanston, Ill., died Jan. 3.

Thomas E. Starzl, '52 MD/PhD, '82 H, of Pittsburgh, died Mar. 4.

John E. Sonneland, '48 MD, '48 MA/MS, of Spokane, Wash., died May 19, 2016.

David E. Streitmatter, '50 MD, '51 GME, of Dallas, died Aug. 24, 2016.

Robert W. Swanson, '63 MD, '69 GME, of Oxford, Ohio, died June 4, 2016.

Sylvan L. Weinberg, '48 MD, of Dayton, Ohio, died Jan. 17.

Sherwood F. Young, '65 MD, of Rochester, Minn., died Oct. 5, 2016.

Patricia Colburn Zeller, '51 BSM, of Littleton, Colo., died Jan. 22.

FACULTY

David A. Drachman, MD, former associate chairman of Neurology, of Concord, Mass., died Dec. 5, 2016.

James C. Erickson III, MD, professor emeritus of Anesthesiology, of Lincolnshire, Ill., died Nov. 16, 2016.

Joseph O. Sherman, MD '62, of Wilmette, Ill. died Sept. 25, 2016.

Upcoming Events

JUN

JUNE 4, 2017
Cancer Survivors' Celebration Walk & 5K
Grant Park, Chicago
Details at 312-695-1300 or cancer.northwestern.edu/walk

JUNE 4, 2017
Nutrition Science From Populations to Plates: What Every Clinician Needs to Know
The Chopping Block
222 West Merchandise Mart Plaza #107, Chicago
Details at 312-694-2249 or cme.northwestern.edu/conferences

JUNE 20, 2017
2017 Annual Lung Symposium
Prentice Women's Hospital
Canning Auditorium, 3rd Fl, 250 E. Superior, Chicago
Details at 312-9080-7737 or medicine.northwestern.edu

JUL

JULY 20-22, 2017
6th Annual Chicago Cardiovascular Update
Northwestern Memorial Hospital Feinberg Pavilion
251 E. Huron, Chicago
Details at 3120503-8533 or cme.northwestern.edu/conferences

MORE EVENTS AT
MAGAZINE.NM.ORG

Applying Humanities Skills to Medicine

In a medical humanities and bioethics seminar called Head Ecorche: The Anatomy of Portraiture, medical students considered how muscles govern facial structure and expression while learning to construct anatomical sculptures using a life-size artificial skull and clay. Medical students complete two seminars in medical humanities and bioethics during their first and second years as part of their curriculum.

New Timeline Maps Medical School's History

Northwestern University Feinberg School of Medicine, originally the medical department of Lind University, was born in Chicago over 150 years ago. The school and its name have evolved significantly since that time, contributing greatly to medical discovery and education, and to the growth and change of the city we are proud to call home. Access our new history timeline and get to know some of our founders and groundbreakers in the magazine's history blog online at *magazine.nm.org*.

15 Years as Feinberg

This year marks the 15th anniversary of the Feinberg School of Medicine naming. Northwestern announced it would change the name of its medical school in 2002 to recognize philanthropic gifts from the Joseph and Bessie Feinberg Foundation and its president, Reuben Feinberg.

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MENTORING OPPORTUNITIES

The **Northwestern Network Mentorship Program** cultivates meaningful professional relationships between alumni and current students. Alumni from all classes may participate as volunteer mentors and/or mentees. **MENTOR.NORTHWESTERN.EDU**

Alumni Physicians of Feinberg unites our renowned alumni and faculty with medical students who want to learn about the daily lives of physicians. This program is especially valuable to students choosing their specialty.

Dinners with a Doc are casual gatherings that provide alumni and students with opportunities to discuss careers in medicine and develop mentoring relationships. Students gain invaluable insight from alumni physicians, who, in turn, learn from the students about the current state of their medical alma mater.

For more information about these programs, please contact Dan Schwarzlose at **312-503-4519** or **daniel.schwarzlose@northwestern.edu.**