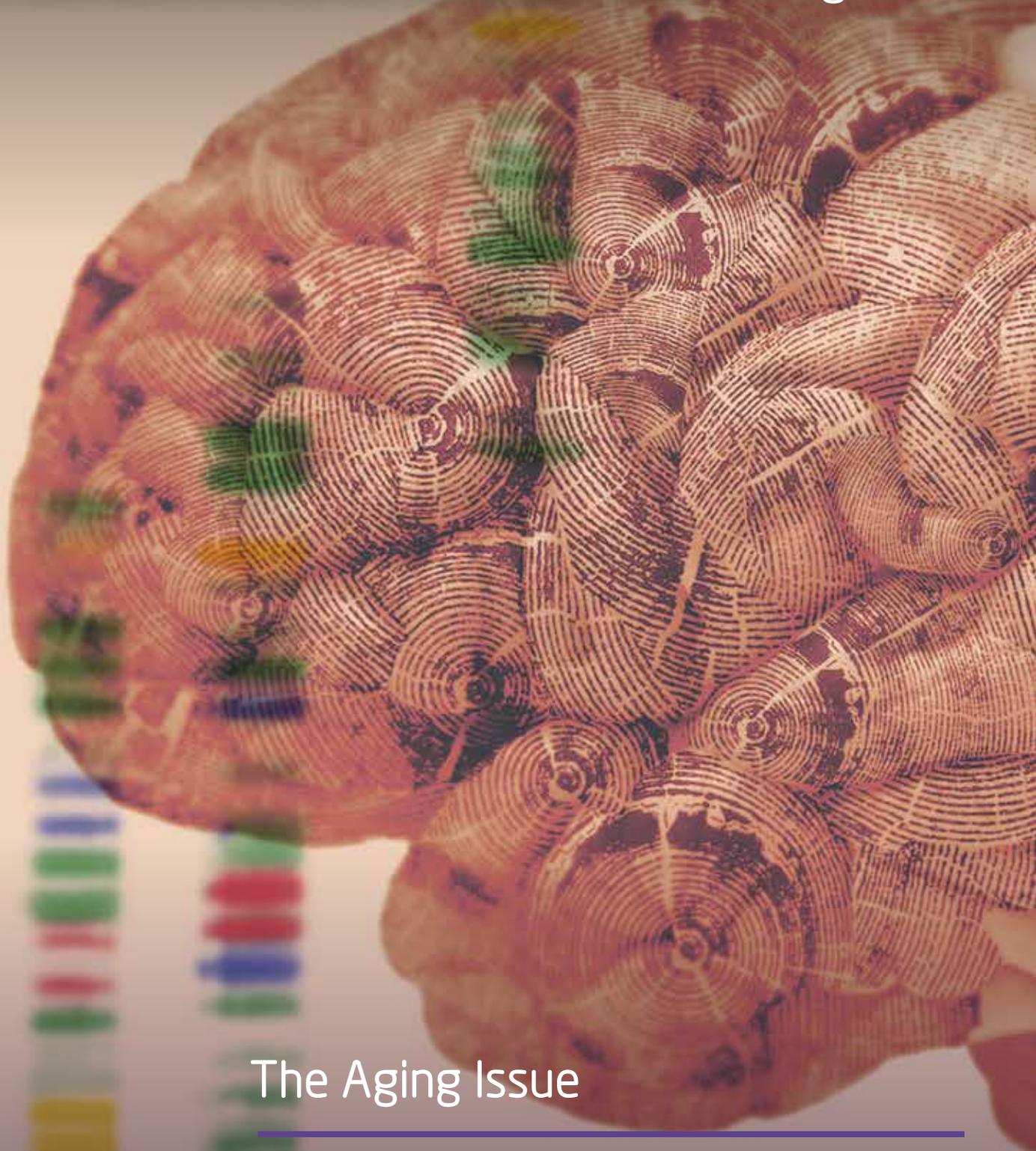


Fall 2016 Volume 03, Number 04

Northwestern Medicine Magazine

A publication for the alumni and friends of Northwestern University Feinberg School of Medicine, Northwestern Memorial HealthCare and the McGaw Medical Center of Northwestern University

Magazine



The Aging Issue

p.14

A quest to lengthen quality life

p.18

Unlocking the secrets to superaging

p.22

Living after cancer

p.26

New division chief targets aging's impact

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A photograph of three medical students running on a red track at Lake Shore Park. The students are running from left to right. The student on the left is a man wearing a purple t-shirt and black shorts. The student in the middle is a man wearing a grey long-sleeved shirt with 'CHICAGO' and 'NORTHWESTERN' printed on it, and blue shorts. The student on the right is a woman wearing a grey long-sleeved zip-up top, black leggings, and pink sneakers. In the background, there is a large green lawn and several tall buildings, including the iconic Gothic-style tower of Northwestern University's Feinberg School of Medicine.

MEDICAL STUDENTS COSTNER MCKENZIE, JACOB NIEB AND SARAH TALAMANTES
TAKE A BREAK FROM CLASS FOR A RUN AT LAKE SHORE PARK. A WELLNESS
PROGRAM AT FEINBERG RECOGNIZES THAT SUCCESS IN MEDICAL SCHOOL —
AND BEYOND — DEPENDS ON NOURISHING BOTH THE MIND AND BODY.

Northwestern Medicine

FALL 2016

Magazine

VOLUME 03, NUMBER 04

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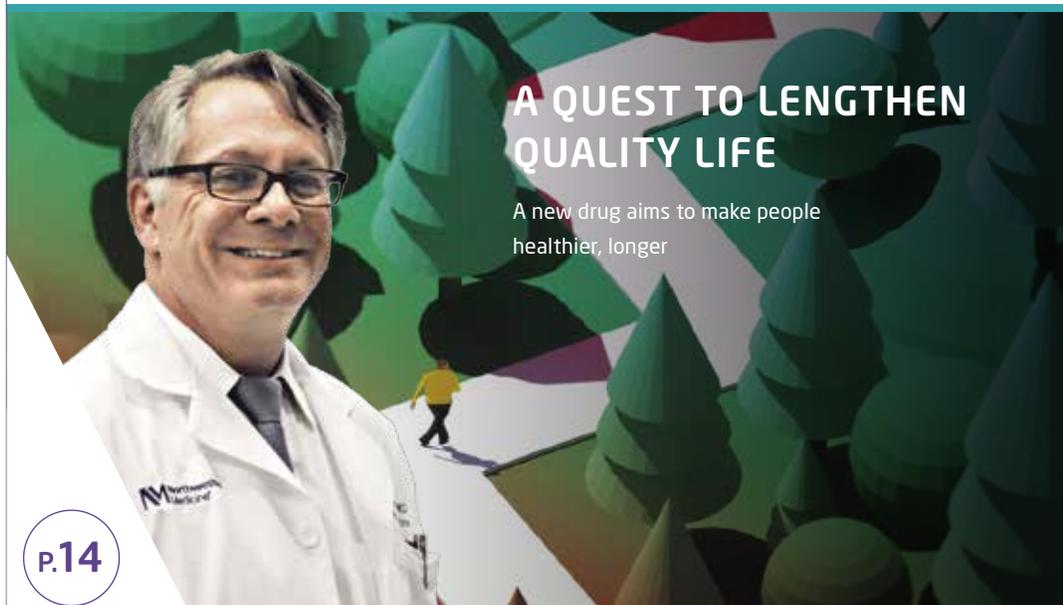
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A QUEST TO LENGTHEN QUALITY LIFE

A new drug aims to make people
healthier, longer

P.14

UNLOCKING THE SECRETS TO SUPERAGING

Why are some people
immune to age-related
cognitive decline?

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LIVING AFTER CANCER

A Northwestern Medicine
initiative supports cancer
survivors

P.22

NEW DIVISION CHIEF TARGETS AGING'S IMPACT

Scott Budinger, MD, leads
Pulmonary and Critical Care
Medicine

P.26



COVER ART: The age of a tree can be assessed by counting the rings on its trunk. Here, a photo composite shows tree rings over a model of the brain. Northwestern Medicine scientists are exploring how the brain changes as people age.

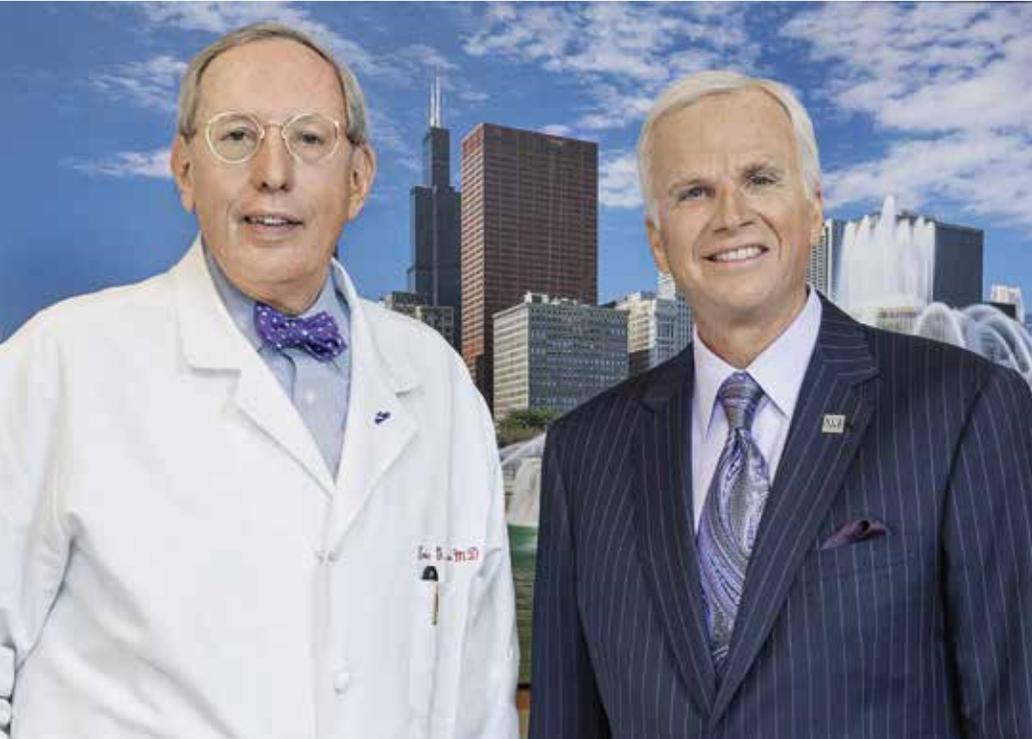
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Northwestern Medicine Leadership



This year, Northwestern Medicine welcomed 163 medical students, 71 PhD students, 244 residents and 150 fellows to our medical school and health system. These extraordinarily talented students and trainees are part of a generation of physicians, scientists and physician-scientists that will practice in a transforming field of medicine, with access to incredible technology and scientific innovations their predecessors could only dream of.

But this new generation will also face unique challenges. One will be taking care of an increasingly aging population. By 2060, the number of people 65 or older living in the United States is expected to double. As educators, investigators and clinicians, we at Northwestern Medicine

are acutely aware of the challenges this growth will bring.

How can we provide the best care possible to an aging population? How can we help patients not just live longer, but live longer with good health? How can we understand what happens to cells and tissues as people grow older and prevent devastating side effects of aging? In this issue of Northwestern Medicine Magazine, we explore how members of our community are tackling these important questions and many others.

Scientists in the lab of Doug Vaughan, MD, chair of the Department of Medicine, are testing a drug that seems to slow the aging process and prolong a healthy lifespan in mice. Members of our Cognitive Neurology and Alzheimer's Disease Center

are studying a set of people in their 80s and 90s with remarkable memories, in hopes of identifying factors that could help patients with neurodegenerative diseases. Scott Budinger, MD, new chief of Pulmonary and Critical Care Medicine, explores how aging affects the lung on a molecular level.

As for patient care, nearly everything we do touches the area of aging, from preventive care to disease management to palliative medicine. In this issue, we highlight our Cancer Survivorship Clinic, which unites oncologists, social workers, nutritionists, psychologists, pharmacists and geriatricians to support patients from cancer diagnosis until the end of life. We also profile alumna and Northwestern Medicine physician Lee Lindquist, MD, MPH, MBA, associate division chief of Geriatrics, who strives to keep seniors living in their homes as long as possible.

Though aging is an inevitable part of life, the work of our investigators and clinicians leaves us with a great sense of optimism about what the future will bring.

With warm regards,

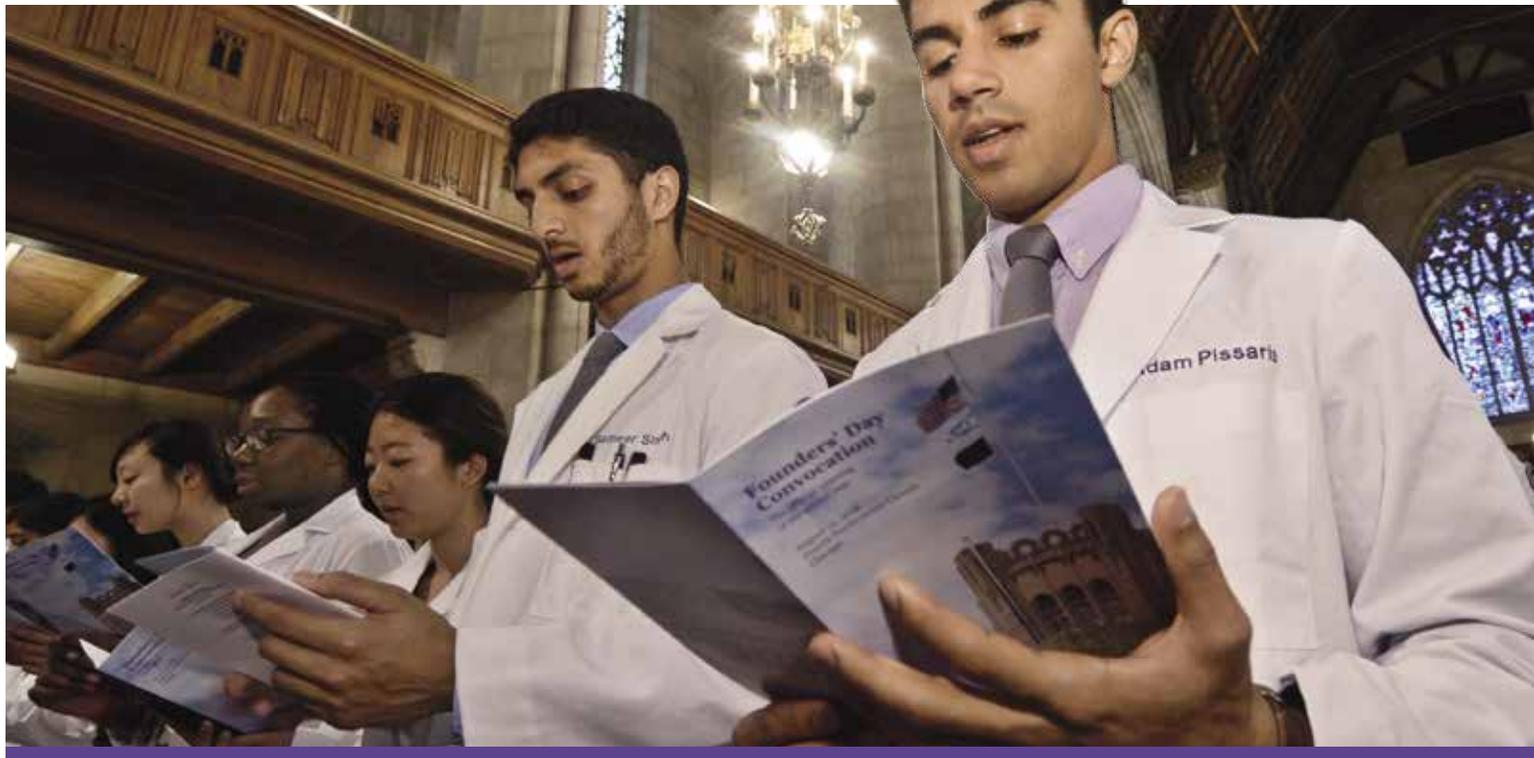
[Eric G. Neilson, MD](#)
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Northwestern Memorial HealthCare

Feinberg Celebrates New Class of Medical Students

WRITTEN BY: Sarah Plumridge

See more photos from Founders' Day online at magazine.nm.org.



FIRST-YEAR MEDICAL STUDENT ADAM PISSARIS RECITES THE DECLARATION OF GENEVA DURING THE FOUNDERS' DAY CEREMONY, WHICH WAS HELD AUGUST 12 AT CHICAGO'S FOURTH PRESBYTERIAN CHURCH.

Founders' Day is an annual celebration honoring Feinberg's founders and welcoming the entering class of first-year medical students to the medical profession. For Faith Svigos, it also signifies a transition from her experiences as a patient and student to her path towards becoming a doctor.

Svigos was born with spina bifida and VACTERL association, a congenital defect that affects the development of the spinal cord and surrounding nerves, and she was a patient at Ann and Robert H. Lurie Children's Hospital of Chicago and Northwestern Memorial Hospital. Many of her physicians and mentors had training at Northwestern and serve as Feinberg faculty members.

"I couldn't be happier that I'm becoming one of their colleagues, embarking on my medical career at the very institution that has made such an impact on my life," Svigos said. "With the unwavering support of my doctors, I've never doubted my potential and

ability to pursue my goals. I feel my life's purpose is to find ways to pass on the profound lessons I've learned from them to my future patients."

Svigos joined 162 other members of the Class of 2020, plus second-year medical students, faculty and families at the 158th Founders' Day gathering on August 12.

"Founders' Day is a tradition here at the medical school. It is mostly about the future," said Eric G. Neilson, MD, vice president for Medical Affairs and Lewis Landsberg Dean, as he welcomed guests. "It is the traditional start of our new academic year; it is also a new beginning for

our students on a path that will lead them into careers of life-long responsibility.”

Amy Paller, MD, chair of Dermatology, delivered the keynote address. She gave students advice and shared her own journey as a physician-scientist.

“You are entering medical school at an exciting time. The practice of medicine is rapidly transforming,” Paller said. “Changes in how we deliver healthcare are rewarding us for focusing on quality, on patient satisfaction and on increasing efficiency. More people than ever have the health insurance they desperately need, promising to reduce healthcare disparities. And the unprecedented pace of discovery, including here at Northwestern, is also driving this transformation.”

During the ceremony, second-year medical students and mentors presented members of the Class of 2020 with white coats and students recited the Declaration of Geneva, the modern-day equivalent of the Hippocratic Oath.

“By choosing this profession, we are opening ourselves up to let others – mostly complete strangers – into our lives,” said first-year medical student Adeolu Ilesanmi. “Those interactions might be brief, but they will also be so powerful because of the knowledge and skills we’ll gain, as well as the strengthened sense of humanity and cohesiveness with our world.”

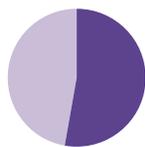
Ilesanmi spent the last year conducting mental health research and education in Nigeria.

“I think Founders’ Day is really the celebration of the fact that we’ve made it to this stage in our lives. We all get to go and grow through this phase together, which is awesome, and makes it slightly less daunting. I look forward to looking back on Founders’ Day in four years and being proud of how far we have come,” Ilesanmi said. **M**

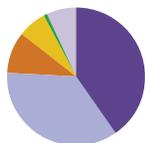
CLASS STATS

23

Median age



53% Men,
47% Women



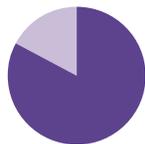
42% White
37% Asian
10% Hispanic
7% African or African-American,
1% Pacific Islander,
4% Unreported

32

States

6

Foreign countries:
Australia, Canada,
Colombia, India,
Singapore and
Ukraine.



83% engaged in research as undergraduate or graduate students



CLASS OF 2020 STUDENTS ADEOLU ILESANMI, BEVERLY ONYEKWULUJE, BITANIA WONDIMU AND ESEOH EHIRIAGHE (TOP) AND CECIL QIU, GRACE CHANDLER, ARIANNA YANES AND WILL GIBB (BOTTOM).

Miller Family Supports Alzheimer's Patients, Family and Caregivers

WRITTEN BY: Andrea Arntsen-Harris

Wendy and Glen Miller recently made a \$1.25 million commitment through their foundation to support the Glen & Wendy Miller Alzheimer's Family Support Program at Feinberg. The gift will directly support the Cognitive Neurology and Alzheimer's Disease Center (CNADC) by expanding education and support programs for individuals and families living with neurocognitive diseases, as well as by increasing the CNADC's collaboration with organizations serving this community.

The Millers' gift also will continue the family's past support of The Buddy Program, establish the Miller Social Work Fellowship Program and help to develop an online education and support program.

"We hope that by focusing our philanthropy on not only the patients, but the caregivers and families, we will touch more people," Glen says.

The couple has been giving to the CNADC since 2008, but their involvement goes back nearly 30 years. After Wendy's mother, Marcy Raftenberg, was diagnosed with Alzheimer's disease at the age of 70, Wendy became one of her primary caregivers alongside her father, Mike Raftenberg. For the next 14 years until her mother's passing, Wendy struggled alongside her parents to deal with Marcy's worsening dementia.

"Alzheimer's is a disease that is beyond words," Wendy says. Glen continued, "We can't let our memory of Marcy be darkness. We want to try and turn it into something good."

Wendy eventually sought help through the Alzheimer's Association and its Family and Caregivers Support Group, where she met Darby Morhardt, PhD, now a research associate professor at the CNADC. In honor of her parents, Wendy created the Family Caregiver Conference in partnership with the Alzheimer's Association, and Morhardt served as a member of its governing board. After the final conference was held in 2008, Wendy got more and more involved with the CNADC.

"What a privilege it has been to work with Wendy over these many years. I am immensely grateful to have her support and that of the entire Miller family," Morhardt says. "Their continued commitment with this extraordinary gift will not only significantly impact quality of life for individuals with neurocognitive diseases and caregiving families, but also will provide essential experiential learning for social workers and future doctors. What a meaningful impact this will ultimately have on the delivery of care for this vulnerable population."



WENDY MILLER'S PARENTS, MIKE AND MARCY RAFTENBERG, ARE PICTURED IN 1991. MARCY WAS 73 AND IN THE EARLY STAGES OF ALZHEIMER'S DISEASE.

PARTNERING WITH THE CNADC

The Buddy Program, led by Morhardt, is a CNADC program very dear to the Miller family. In fact, the Millers provided some of the first major philanthropic support for it in 2009. Founded in 1997, The Buddy Program provides unique, experiential learning to address a lack of understanding of and appreciation for dementia-related healthcare issues in medical student education by pairing first-year medical students with patients. It also offers mentorship opportunities for people in the early stages of Alzheimer's disease. The program has gained national recognition and been successfully replicated at nine medical schools beyond Feinberg.

"I have watched The Buddy Program grow through Darby's efforts. We think it's wonderful and have the utmost respect for her efforts, innovation and passion," Wendy says. "I wish The Buddy Program had been around when my mother was here."

Thanks to the Millers' generosity, the CNADC will be able to provide opportunities for patients and families to meet with social workers for assessments and linkages to resources, education and support. This includes three monthly support groups already offered by the CNADC. With philanthropic aid for recruiting new staff members, the CNADC also will be able to provide more patients and families with individualized psychosocial support.

Read more about the Millers online at magazine.nm.org. 

Bringing LGBT Health to the Forefront

WRITTEN BY: Nora Dunne

The people living in Illinois state Rep. Greg Harris's district speak 63 different languages. Providing effective healthcare to such a diverse population requires understanding an individual patient's cultural norms, from faith and family traditions to stigmas faced. That same understanding is necessary for LGBT people, explained Harris at Northwestern's first annual State of LGBT Health Symposium.

"We really need to start paying attention to how gender identity and sexual orientation also impact the delivery of healthcare," said Harris, who chairs the House committee that approves budget appropriations for human services, including healthcare. "We need to ensure that there is no wrong door, that when a person goes into a facility and needs healthcare they are welcomed and the provider is able to look at their medical history and treat them in a culturally competent, caring and compassionate way."

On August 18, the Northwestern Institute for Sexual and Gender Minority Health and Wellbeing (ISGMH) hosted scientists, policymakers and community members to discuss how resources are being mobilized to improve the health of lesbian, gay, bisexual, transgender, queer and gender-nonconforming people.

Karen Parker, PhD, director of the National Institutes of Health (NIH) Sexual & Gender Minority Research Office, delivered a keynote lecture on the NIH's strategic plan to advance research in this area across its 27 institutes and centers. In fiscal year 2015, the NIH awarded \$162 million to support research related to sexual and gender minorities (SGM). About three-quarters of the projects centered on HIV/AIDS.

"Obviously HIV/AIDS work is extremely important, but there are so many other issues and diseases that we really need to be focusing more on," Parker said. "We held listening sessions with stakeholders, really looked at the needs of the community and asked: What are the critical research questions that we need to be prioritizing?"

She said the NIH is particularly interested in supporting research exploring SGM health disparities. Members of this population not only have higher rates of depression and anxiety disorders, substance abuse and sexually transmitted diseases, but also of certain types of cancer.

"How are things like minority stress impacting cancer, diabetes, arthritis?" Parker said. "One of the reasons this office was

// We really need to start paying attention to how gender identity and sexual orientation also impact the delivery of healthcare. //



KAREN PARKER, PHD, DIRECTOR OF THE NATIONAL INSTITUTES OF HEALTH (NIH) SEXUAL & GENDER MINORITY RESEARCH OFFICE, DELIVERED A KEYNOTE LECTURE ON THE NIH'S STRATEGIC PLAN TO ADVANCE RESEARCH TO IMPROVE THE HEALTH OF LESBIAN, GAY, BISEXUAL, TRANSGENDER, QUEER AND GENDER-NONCONFORMING PEOPLE.

established was so we could start to think about how SGM applies to all the disorders that NIH supports."

Parker also praised the ISGMH for spearheading research in the relatively new arena.

"Northwestern is the first of hopefully many universities that step up to the plate and say this is a really critical research area," she said. **M**

Physician for Paralympic Soccer Team Shares Experience in Rio

WRITTEN BY: Sarah Plumridge

The highlight of the Paralympic Games in Rio de Janeiro for Monica Rho, '05 MD, '09 GME, head team physician for the U.S. Paralympic Men's Soccer Team and assistant professor of Physical Medicine and Rehabilitation (PM&R), was watching star defender Josh Brunais carry the U.S. flag for the closing ceremony on September 18.

"Watching him carry the nation's flag was a special moment for all of us on the team," said Rho, who is also section chief of musculoskeletal medicine at the Rehabilitation Institute of Chicago.

Rho spent the past year with the men on the team, who have various diagnoses such as cerebral palsy, stroke and traumatic brain injury. As one of their traveling physicians, she had the opportunity to learn every aspect of their lifestyle, beyond sports injuries.

Rho recalled the first time she traveled with Brunais, a U.S. Army veteran who had been in a helicopter crash during his service.

"I saw his terror. I witnessed his PTSD symptoms as they were happening and watched him have the courage to get on the airplane," she said. "When patients come to see you, they tell you about experiencing anxiety, but when you are traveling with a team, you live it. Seeing that firsthand enhances your ability to care for your patients."

Throughout the games, the team faced many challenges, including a key player breaking his second metatarsal – a long bone in the foot – during their first match.

"It was heartbreaking to lose a player in the first match against the Netherlands," Rho said. While the team didn't make it to the

medal round, Rho said they played their "hearts out" and finished in seventh place.

While in Rio, Rho enjoyed watching athletes in other sports such as wheelchair rugby, swimming and sitting volleyball.

"Watching other sports was outstanding. I saw an athlete with one arm and no legs compete in a breaststroke final and watched the U.S. women's sitting volleyball team win a gold medal," Rho said. "At the Paralympics, you see all of these athletes with disabilities at their highest point. As a physician, you usually see them at their lowest and don't always see what they end up accomplishing."

Rho learned of the opportunity through George Chiampas, DO, assistant professor of Emergency Medicine and Orthopaedic Surgery at Northwestern and chief medical officer at U.S. Soccer. The position was the perfect fit, combining Rho's educational background and expertise in PM&R and sports medicine.

She and colleague Daniel Blatz, MD, MPH, '13 GME, instructor of PM&R, will continue to work with the team as they carry on monthly training camps and compete in various tournaments in the future. **M**

MONICA RHO, '05 MD, '09 GME, WAS HEAD TEAM PHYSICIAN FOR THE U.S. PARALYMPIC MEN'S SOCCER TEAM, WHICH COMPETED IN THE PARALYMPIC GAMES IN RIO DE JANEIRO, BRAZIL.



Research Briefs

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



Guidelines Published for Managing Chronic Pain in Cancer Survivors

An expert panel led by Northwestern Medicine investigator Judith Paice, PhD, RN, has developed recommendations to help clinicians manage the chronic pain of cancer survivors. Their guidelines were published in the *Journal of Clinical Oncology*.

As cancer diagnoses and treatments improve, so do patient outcomes. But many people who survive cancer will live with a host of ongoing side effects. Indeed, there are more than 14 million cancer survivors in the United States, and studies suggest that close to 40 percent of them suffer from chronic pain.

“Pain is a serious medical and public health problem, as are addiction and misuse of opioids,” says Paice, a research professor of Medicine in the Division of Hematology/Oncology. “The goal is to ensure safe and effective pain control.”

Paice was part a multidisciplinary group of clinicians convened by the American Society of Clinical Oncology to systematically review studies on chronic pain management in cancer survivors. Based on the findings, the panel developed a list of recommendations to assist all kinds of clinicians who work with these patients. The guidelines are the first to address the growing population of cancer survivors with chronic pain.

“These guidelines are also unique in describing the wide range of pain syndromes associated with cancer treatment,” says Paice. The recommendations cover screening and assessment, treatment and care, as well as risk assessment, mitigation and precautions to take with opioid use – the latter a new area of emphasis for the oncology community, according to Paice.

Read about a Northwestern Medicine clinic that supports cancer survivors on p.22. **M**

Fruit Flies Inform Understanding of Human Gene Expression

When it comes to gene regulation, there are more similarities between fruit flies and humans than previously thought, according to Northwestern Medicine research published in *Molecular Cell*.

“In flies, the decision to turn a gene off can be locked in place by factors called Polycomb-group proteins; however, this locking mechanism can be counteracted by a protein called Trithorax (trx) to keep the gene on,” explains Ryan Rickels, first author of the paper and a PhD student in the Driskill Graduate Program. “We found many similarities between flies and humans regarding how these two opposing protein complexes strike a balance to keep a gene either on or off.”

Rickels conducted the research in the lab of senior author Ali Shilatifard, PhD, the Robert Francis Furchgott Professor and chair of Biochemistry and Molecular Genetics.

“We were curious to learn more about trx because its human homolog, MLL1, is highly mutated in several aggressive leukemias,” Rickels says. “By taking what we learned in flies and applying it to human cells, we were able to identify a set of genes which remain balanced by the actions of MLL1 and Polycomb.” **M**

This research was supported by the National Cancer Institute (R35CA197569).



Age-Related Infertility May Be Caused By Scarred Ovaries

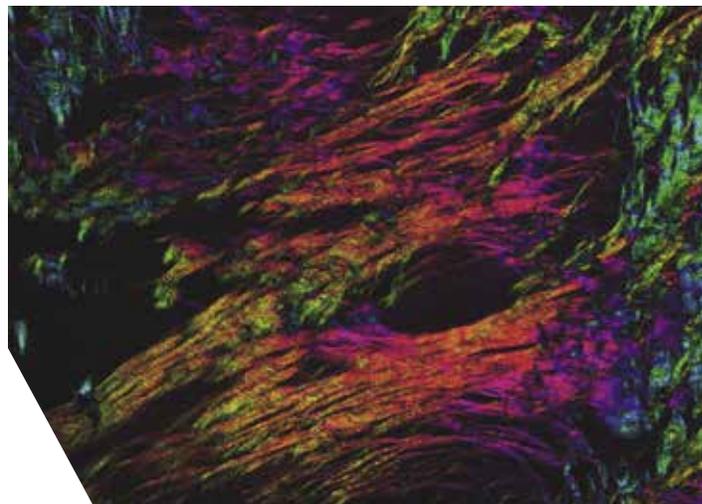
Women's decreased ability to produce healthy eggs as they become older may be due to excessive scarring and inflammation in their ovaries, reports a new study in mice.

This is the first study to show the ovarian environment ages and that aging affects the quality of eggs it produces. These findings could result in new treatments that preserve fertility by delaying ovarian aging.

Most reproductive research focuses on women's eggs and trying to understand why their number and quality deteriorate as a woman enters her forties. Deteriorating eggs contribute to infertility, miscarriages and birth defects.

But in this study, published in the journal *Reproduction*, scientists examined the reproductive age-related changes that occur in the environment in which the eggs develop, known as the ovarian stroma. The environment in which cells grow and develop can greatly influence their quality and function, but surprisingly little is known about how the ovarian stroma changes with age.

"Under the microscope, eggs from reproductively young and old animals may look identical, but the environment in which they are growing is completely different," says lead study author Francesca Duncan, executive director of the Center for Reproductive Science at



Northwestern. "Ovaries from reproductively old mice are fibrotic and inflamed. There is no way this environment won't impact the eggs growing in it, and it very likely contributes to their decrease in quality." 

This work was supported by the Center for Reproductive Health After Disease (P50 HD076188), National Centers for Translational Research in Reproduction and Infertility, Centers of Biomedical Research Excellence (P20 GM104936), National Center for Research Resources (P20 RR021940), National Institute of General Medical Sciences (P20 GM103549) and National Institute of Environmental Health Sciences (T32 ES007079).

2010 Cholera Epidemic Linked to Hypervirulent Strain

In January 2010, a catastrophic earthquake hit Haiti, killing more than 200,000 people and displacing over 1 million, according to the Centers for Disease Control and Prevention (CDC), and creating the ideal conditions for the spread of cholera.

Conditions facilitating infection with *Vibrio cholerae* bacteria, the pathogen responsible for cholera, included contaminated water and food sources, inadequate water treatment and poor sanitation and hygiene. Following the initial identification of cholera in October 2010, the CDC reports that over 470,000 Haitians were diagnosed with the severe diarrheal illness and nearly 7,000 died.

In a recent study published in *Infection and Immunity*, scientists at Northwestern and the University of California at Santa Cruz

discovered that the *V. cholerae* strain responsible for the 2010 epidemic in Haiti is a hypervirulent variant.

For the past 50 years, the cholera pandemic has stemmed from a strain called El Tor O1, which spread globally in three distinct waves. The wave 3 altered El Tor (AET) *V. cholerae* line has been the primary cause of human cholera disease since the late 1990s. The emergence of this new strain is linked to a higher incidence of lethal outcomes. 

This research was funded by the Northwestern Medicine Catalyst Fund, National Institute of Allergy and Infectious Diseases (R01AI092825, R01AI098369 and R01AI102584) and National Institute of Diabetes and Digestive and Kidney Diseases (1F30DK084623).

Media Spotlight

1 ALZHEIMER'S PATIENTS KEEP THE SPARK ALIVE BY SHARING STORIES

THE NEW YORK TIMES

An unusual eight-week storytelling workshop at Northwestern University is helping to keep the spark of love alive in couples coping with the challenges of encroaching dementia. The workshop, which started in January of 2014, was the brainchild of Lauren Dowden, a social worker at Northwestern's Cognitive Neurology and Alzheimer's Disease Center. She quickly learned from family members in a support group that "their concerns were not being addressed about dealing with loss, not just of memory, jobs and independence, but also what they shared as a couple."

2 SHE WANTS TO MAKE AN AUTONOMOUS WHEELCHAIR

CRAIN'S CHICAGO BUSINESS

Brenna Argall, PhD, assistant professor of Physical Medicine and Rehabilitation, and her colleagues are working on a smart version of a familiar off-road vehicle: a wheelchair. Backed with \$2.5 million in federal grants, they hope to field a commercially feasible model within five years that leaves the user in charge but learns from what it's told, making control simpler, reaction time faster and collision avoidance easier.

3 WHY I GO TO ALEPPO

THE NEW YORK TIMES

Samer Attar, MD, assistant professor of Orthopedic Surgery wrote about his work at an underground hospital in Syria. "They are exhausted, endangered and they need help. That is why I volunteer for medical work in Syria; even the few weeks a year that I can offer provide some respite for the handful of surgeons who serve a population of 300,000 in a war zone. It is a heavy responsibility, but I feel I cannot ask world leaders to risk their citizens' lives to save people there if I myself am unwilling to take such risks."

4 ILLINOIS EMERGENCY ROOM VISITS INCREASED AFTER OBAMACARE

CHICAGO TRIBUNE

Hospital emergency department visits increased in Illinois after the Affordable Care Act took effect – the opposite of what many hoped would happen under the landmark healthcare law, according to a new study. "Emergency departments are already overcrowded, and bringing more patients in will continue to make that worse," said Scott Dresden, MD, assistant professor of Emergency Medicine and lead author of the study. Emergency department visits were increasing before the Affordable

Northwestern Hospitals Among the Best in Latest Rankings



Four Northwestern Medicine hospitals have been recognized by *U.S. News & World Report* in its 2016-17 ranking of America's Best Hospitals.

Northwestern Memorial Hospital is again one of the top hospitals in the country, ranking 8th on the prestigious Best Hospitals Honor Roll. Northwestern Memorial is also ranked 1st in both the Chicago Metro Region and Illinois for the fifth consecutive year. Northwestern Medicine Central DuPage Hospital is ranked 7th in both the Chicago Metro Region and Illinois. Northwestern Medicine Delnor Hospital and Northwestern Medicine Lake Forest Hospital are tied for 19th in the Chicago Metro Region and 27th in Illinois.

"With four of our hospitals and 13 clinical care specialties recognized by *U.S. News*, this is an achievement that further distinguishes Northwestern Medicine as Chicago's premier academic

Care Act took effect, Dresden said, but the jumps revealed by the study go beyond those increases.

5 WOMEN IN MEDICINE NEED TO STAND BY THEIR CAREER AND FAMILY CHOICES

STAT

Angira Patel, MD, '10 '11 GME, and Sarah Bauer, MD, both assistant professors of Pediatrics, wrote a commentary about the inequalities women face in academic medicine. "... we need to stand behind our choices – to work, to stay at home, to have a family, to not have a family, to do both – and not be saddled with regret or anguish. Supporting one another in executing these choices should be the next mission of women in medicine, and the workplace in general. Only with this frame of mind and an open honest dialogue can we address the existing dearth of inequalities and female leadership in medicine and encourage women to stay in the game."

6 NFL PLAYERS' CAREERS MOST IMPACTED BY CERTAIN KNEE INJURIES

WTTW CHICAGO TONIGHT

Avid sports fan Wellington Hsu, MD, Clifford C. Raisbeck, MD, Professor of Orthopaedic Surgery, said he's frequently heard

sportscasters make "very bold comments" about injured players' futures, including "the players are never the same again or their career is done after this injury." In 2009, Hsu began researching how spinal injuries affected athletes' ability to return to play, as well as the players' subsequent performance and career length. The results of his various studies showed that the players exceeded speculation by sportscasters.

7 ARE WE REACHING THE END OF THE TREND FOR LONGER, HEALTHIER LIVES?

NPR

Since the 1960s, life expectancy for Americans has been steadily increasing, thanks to a remarkable reduction in heart disease. Now that trend is slowing. "The greater cause of the stagnation in cardiovascular death rates is that the obesity epidemic, which started in this country in about 1985, is finally coming home to roost," said Donald Lloyd-Jones, MD, chair of Preventive Medicine. Obesity raises blood pressure, cholesterol levels and the risk of diabetes. "All the things that put us at risk for heart disease and stroke get much, much worse," he said.

health system and reaffirms our commitment to providing world-class healthcare to our patients," says Dean M. Harrison, president and chief executive officer of Northwestern Memorial HealthCare.

Four specialties at Northwestern Memorial received top 10 recognition: Cardiology & Heart Surgery (6th), Orthopaedics (6th), Geriatrics (9th) and Neurology & Neurosurgery (9th).

RIC AND LURIE CHILDREN'S RANK ON TOP

Meanwhile, the Rehabilitation Institute of Chicago (RIC) has again been recognized as the national leader in physical medicine and rehabilitation, topping the *U.S. News* list for the 26th consecutive year. RIC is the only hospital of its kind to hold this distinction.

"RIC's pioneering spirit has come to define the field of physical medicine and rehabilitation, and it's an honor to once again earn

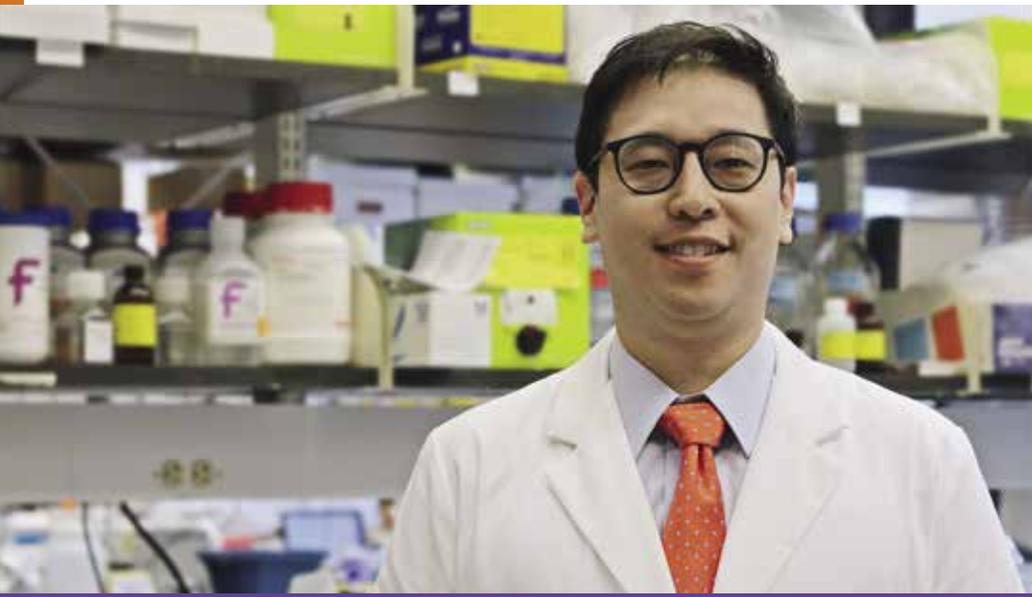
the recognition of physicians and *U.S. News & World Report*," says Joanne C. Smith, M.D., RIC's president and CEO.

Earlier this summer, *U.S. News* ranked Ann & Robert H. Lurie Children's Hospital of Chicago the top children's hospital in Illinois and 6th in the country. Lurie Children's is also the only Illinois children's hospital named to the Honor Roll, with five specialties in the top 10: Gastroenterology (4th), Neonatology (6th), Neurology/Neurosurgery (6th), Urology (7th) and Kidney Disease (10th).

"Our number six national ranking reflects the major strides we have made to retain and recruit top pediatric specialists, improve safety, quality and family experience, and advance scientific discovery and innovation," says Patrick Magoon, president and CEO of Lurie Children's. **LM**

Faculty Awards and Honors

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



JAEHYUK CHOI, MD, PHD, RECEIVED THE 2016 DAMON RUNYON CLINICAL INVESTIGATOR AWARD.

Jaehyuk Choi, MD, PhD, Ruth K. Freinkel, MD, Research Professor and assistant professor of Dermatology and Biochemistry and Molecular Genetics, received the 2016 Damon Runyon Clinical Investigator Award. He will be co-funded through a partnership with the Doris Duke Charitable Foundation through its 2016 Clinical Scientist Development Awards, which provide grants to junior physician-scientists to facilitate their transition to independent clinical research careers.

Choi has recently used next generation sequencing to identify gene mutations that he hypothesizes are important for the pathogenesis of cutaneous T cell lymphoma (CTCL), an incurable cancer of the immune T-cells in the skin. His ultimate goal is to identify novel therapeutic strategies that selectively target CTCL cancer cells, hastening the development of a cure for this intractable disease.

Zeesan Butt, PhD, associate professor of Medical Social Sciences, Psychiatry and

Behavioral Sciences and Surgery, was appointed by the Patient-Centered Outcomes Research Institute (PCORI) as a member of its advisory panel on Assessment of Prevention, Diagnosis, and Treatment Options. He will help PCORI refine and prioritize research funding priorities and ensure that research the institute supports centers on outcomes that matter to patients and other health-care decision makers.

PCORI is an independent, nonprofit organization authorized by Congress to fund research that will provide patients, their caregivers and clinicians with the evidence-based information needed to make better-informed healthcare decisions. Butt also serves as the associate director for Northwestern University's Center for Patient-Centered Outcomes. His research focuses on the development and



application of patient-reported outcomes (PROs) in the post-surgical context, with an eye toward improved care quality and patient-centeredness.

Kathleen Green, PhD, the Joseph L. Mayberry, Sr., Professor of Pathology and Toxicology and professor of Dermatology, was elected to the German National Academy of Sciences, in recognition of her scientific achievements. The German National Academy of Sciences, formerly known as the Leopoldina, is the oldest German-speaking society of scholars, providing science-based advice to politics and society.

D. Martin "Marty" Watterson, PhD, John G. Searle Professor of Molecular Biology and Biochemistry, was awarded the 2016 Goodes Prize for Excellence in Alzheimer's Drug Discovery. This is an annual lifetime achievement award given by the Alzheimer's Drug Discovery Foundation.

Ankit Bharat, MBBS, assistant professor of Surgery in the Division of Thoracic Surgery and of Medicine in the Division of Pulmonary and Critical Care Medicine, received the 2016 Jacobson Promising Investigator Award from the Academic College of Surgeons.

Ali Shilatifard, PhD, Robert Francis Furchgott Professor and chair of Biochemistry and Molecular Genetics, was named the 15th recipient of the Martin E. and Gertrude G. Walder Award for Research Excellence. This award, established in 2002 by Joseph A. Walder, MD, PhD, and given annually by the provost, recognizes excellence in research at Northwestern.

Michael Markl, PhD, the Lester B. and Frances T. Knight Professor of Cardiac Imaging in the Departments of Radiology and Biomedical Engineering, was named a

fellow of the International Society of Magnetic Resonance in Medicine. His research group has been instrumental in establishing 4D Flow MR imaging methods and data analysis tools for the comprehensive assessment of 3D blood flow and cardiovascular function. Further accomplishments include the development, validation and application of novel imaging tools for the evaluation of structure and function of the heart.



original investigations in the clinic and laboratory, develop teaching methods and freely and informally interchange ideas.

James Surmeier, PhD, Nathan Smith Davis Professor and chair of Physiology, was awarded the 2016 C. David Marsden Presidential Lecture Award by the International Parkinson and Movement Disorder Society for his contributions to the understanding of the mechanisms underlying Parkinson's disease.

Jacob Sznajder, MD, Ernest S. Bazley Professor of Asthma and Related Disorders, was named a fellow of the European Respiratory Society, recognition of lifetime excellence and contributions to research, education and clinical leadership in respiratory medicine. He was also honored with the Acute Respiratory Distress Syndrome Foundation's Excellence Award.

Rukhsana Mirza, MD, associate professor of Ophthalmology, received the 2016 Award for Excellence in Medical Student Education given by the American Academy of Ophthalmology and the Association of University Professors of Ophthalmology. The award recognizes the critical role of medical student education directors and celebrates their contributions.

Lee Jampol, MD, Louis Feinberg, MD, Professor of Ophthalmology, received the Crystal Apple award for excellence in teaching and mentorship from the American Society of Retina Specialists. In addition, the Cyrus Chung Ying Tang Foundation made a \$3 million gift to create the Cyrus Tang and Lee Jampol Professorship in Ophthalmology.

Paloma Toledo, MD, MPH, assistant professor of Anesthesiology, was elected as a member of the Association of University Anesthesiologists, an organization that advances the art and science of anesthesiology by encouraging members to pursue



Kelly N. Michelson, MD, MPH, director of the Institute for Public Health and Medicine's Center for Bioethics and Medical Humanities and associate professor



of Pediatrics in the Division of Critical Care, was formally invested as the Julia and David Uihlein Professor of Bioethics and Medical Humanities. Michelson's research focuses on communication and decision-making in the pediatric intensive care unit and pediatric palliative care settings.

Robert L. Vogelzang, MD, was invested as the Albert Nemcek Professor of Interventional Radiology Education. Vogelzang is a national leader in interventional radiology.

Deborah Clements, MD, chair of Family and Community Medicine, was appointed as a

member of the National Resident Matching Program's (NRMP) board of directors. The NRMP is a non-profit organization that matches fourth-year medical students to U.S. residency programs.

Aarati Didwania, MD, '04 MSCI, associate professor of Medicine in the Division of General Internal Medicine and Geriatrics, was named director of the Honors Program in Medical Education (HPME).



Didwania is director of the Robert H. Lurie Comprehensive Cancer Center of Northwestern University's Survivors Taking Action and Responsibility Program for adult survivors of pediatric cancer.

At the fifth annual Driskill Day, held by the Walter S. and Lucienne Driskill Graduate Program in the Life Sciences (DGP), **Christopher Payne, PhD**, assistant professor of Pediatrics, received the faculty service award; **Karla Satchell, PhD**, professor of Microbiology-Immunology, and **Murali Prakriya, PhD**, associate professor of Pharmacology, received the Dean's teaching award.



KARLA SATCHELL, PHD, RECEIVED THE DEAN'S TEACHING AWARD FROM STEVE ANDERSON, PHD.

Michael Fotis, BS Pharm, lecturer of Medical Education in the Physician Assistant Program, received the Amy Lodolce Mentorship Award from the Illinois Council of Health System Pharmacists. **IM**



A new drug could make people healthier, live longer

WRITTEN BY: Sarah Plumridge

THE QUEST TO LENGTHEN QUALITY LIFE

In the near future, it could be possible to give a 75-year-old the vitality and health of a 50-year-old. It could be possible, even, to reverse the effects of diabetes, kidney failure and other age-related diseases, all thanks to a drug that has the potential to slow the aging process.

Developed by Japanese scientists and tested in animal models in collaboration with Northwestern Medicine scientists, this drug blocks the activity of a protein called plasminogen activator inhibitor-1 (PAI-1), which is overexpressed in many diseases including metabolic syndromes, blood disorders and cardiovascular diseases.

"We are particularly interested in applying drugs to groups of patients that age rapidly, such as people with chronic kidney disease," says Douglas Vaughan, MD, chair of the Department of Medicine. "A 25-year-old that goes on dialysis has the cardiovascular risk of a 75-year-old. We really don't have any good therapies to slow down cardiovascular disease in that population."

Other patients, including those with HIV infections and diabetes, also suffer from accelerated aging and could benefit from a drug like the PAI-1 antagonist.

Vaughan and his group have studied PAI-1 and its role in cardiovascular disease for nearly 30 years. Through their experiments, they observed that PAI-1 is created as cells age, during a biological process called senescence.

Before joining Northwestern in 2008, Vaughan's lab at Vanderbilt University Medical Center created a transgenic mouse model that overexpressed human PAI-1. The mice expressed an

accelerated aging phenotype with features such as baldness and were prone to heart attacks at an early age.

"Surprising to us, the mouse not only had clogged arteries but also a number of other phenotypes," said Mesut Eren, PhD, research assistant professor of Medicine in the Division of Cardiology, who developed the mouse model. "The most striking was hair loss; as the mice grow old, they become almost totally nude. They also develop huge spleens and livers and build up amyloid, which is the same protein that can cause Alzheimer's disease. These are all characteristics of mammals as they age."

"It made us think PAI-1 might be related to aging," sums up Vaughan.

With a variety of mouse lines available with rapid aging phenotypes, Vaughan decided to test another hypothesis: that PAI-1 contributes to the aging of a mouse model with a deficiency in another protein known as Klotho. These mice have a short lifespan, arteriosclerosis and emphysema.

"We asked the question: If you take PAI-1 out of the Klotho-deficient mice, what happens?" Vaughan recounts.

The study found that when PAI-1 was either completely or partially taken out of the Klotho-deficient mice, the mice had a prolonged lifespan. In addition, their cells had delayed senescence and their organs were protected. The results, published in a paper in the *Proceedings of the National Academy of Sciences*, also showed that Klotho-deficient mice treated with the protein antagonist drug had the same results as the genetically deficient PAI-1 mice.

Meanwhile, collaborator Toshio Miyata, a professor at Tohoku University in Japan, was interested as a nephrologist in PAI-1



“We hope that taking a drug like this will prolong the health span of people, make them functionally healthy for longer.”

DOUGLAS VAUGHAN, MD
CHAIR OF THE DEPARTMENT OF MEDICINE

because of its role in diabetic kidney disease. Miyata screened potential inhibitors of PAI-1 and came up with a group of compounds that block PAI-1 but leave other proteins alone. When he heard about Vaughan’s mouse model that overexpressed the human form of PAI-1, he asked to test it.

Vaughan admits, “I wasn’t overly enthusiastic to test the drug because we had tested other inhibitors developed by pharmaceutical companies over the years and nothing had worked very well. But he sent us the drug, we fed it to the mice and they started growing hair – it reversed their baldness phenotype. The drug really worked.”

“We were always interested in a molecule that can inhibit PAI-1, but because of the structure of PAI-1 it’s difficult to effectively inhibit it,” Eren said. “We’ve worked with several inhibitors and the best so far was the one discovered by Dr. Miyata at Tohoku University. When I feed the inhibitor to the Klotho mice, they live longer and their blood chemistry improves significantly. This has been a starting point for the lab to focus on various aspects of senescence and aging.”

To date, the team has published more than a dozen papers testing the drug in a variety of ways, creating a clinical portfolio to test in human populations.

“We hope that taking a drug like this will prolong the health span of people, make them functionally healthy for longer,” Vaughan says.

A MUTATION IN A SMALL POPULATION

An Amish population in Berne, Indiana, is the only known human population in the world that has a PAI-1 deficiency. Intrigued to learn if the carriers of this mutation are protected from biological aging, Vaughan partnered with Amy Shapiro, MD, a pediatric hematologist-oncologist who has studied this community since the early 1990s.

While studying blood coagulation disorders, Shapiro discovered the PAI-1 deficiency in a young woman in this Amish population. With collaborators from the University of Michigan, she found the gene mutation involved an insertion of two base pairs, creating a premature stop codon in the PAI-1 gene. Originally from Switzerland, this group of Amish people has a mutation in PAI-1 that’s been handed down through generations.

“I read about this Amish population in 1992 in the *New England Journal of Medicine* and dreamed for a long time of studying them,” Vaughan says. “But I didn’t have a hypothesis to test. Then as we developed the aging study more, we found the effects of PAI-1 deficiency on aging in the Klotho-deficient mice and wanted to learn if these Amish people would be protected from aging.”

Funded by a National Institutes of Health grant, Vaughan and Shapiro visited members of this Amish community and assessed



MESUT EREN, PHD, RESEARCH ASSISTANT PROFESSOR OF MEDICINE
IN THE DIVISION OF CARDIOLOGY

them over two days. They measured blood pressure, did echocardiograms and took blood samples. Vaughan estimates there are at least 115 carriers of the mutant gene and at least 10 that are homozygous (have two copies) for the PAI-1 deficiency.

The results of the study, to be published in an upcoming paper, suggest that Vaughan's hypothesis is correct. The carriers of the mutant gene exhibit protection from aging and don't have the bleeding disorder.

Other aging studies – working with everything from worm to mouse models – have also found that insulin and insulin-like growth factors have a role in the aging process. The carriers of the mutant PAI-1 gene also have a significantly lower level of insulin, just as one would predict if they are protected from aging, Vaughan added.

"We have data at the cellular level that PAI-1 is involved in senescence and data from mouse models that PAI-1 contributes to age-related changes, and now we have data from human beings that are PAI-1 deficient," Vaughan says.

NEW CLASS OF DRUGS AND THE FUTURE

Interest in longevity research continues to grow. A program at the National Institute on Aging is currently testing the PAI-1 antagonist drug to see if it will prolong the lifespan of healthy "normal" mice. Two other drugs that appear to have an effect on lifespan that have gone through the program include metformin, a diabetes drug, and rapamycin, an immunosuppressant. This past spring, metformin was FDA approved to undergo clinical trials in humans to find out if it can protect against aging diseases.

"There are a lot of people thinking about ways to prolong lifespan in people," Vaughan says. "We think eventually a PAI-1 antagonist will be part of a group of interventions that a healthy person might have as part of a combined therapy to slow the aging process."

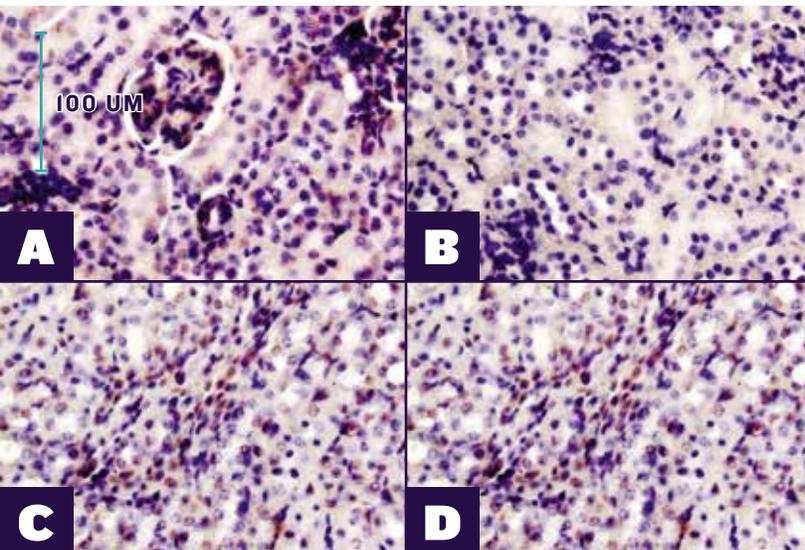
As part of this surge in research, Vaughan is competing for \$1 million against nearly 30 teams for the Palo Alto Longevity Prize, founded by Joon Yun, MD, a radiologist and president of Palo Alto Investors. While the teams are taking different approaches to delay aging, they have a common goal to identify a therapy intervention that either increases the lifespan of mice or reverses cardiovascular aging in mice. Vaughan believes his chances to win are good, if the results from the National Institute on Aging program are positive.

Vaughan and his team have plans for future studies exploring how the PAI-1 antagonist drug could work as a topical treatment for hair growth, to help people with diabetes and obesity, and even to prolong the lifespan of dogs.

"We are continuing to discover new functions for PAI-1," Eren says. "Aging and hair loss are exciting new frontiers in the PAI-1 field."

In Japan, the drug has gone through phase I clinical trials and is starting phase II studies. Vaughan says his group is working to facilitate early-phase testing in the United States.

"There isn't a lot of enthusiasm for living longer if you are ravaged by diseases, but I think a lot of people would be interested in living longer if they could maintain their vitality and vigor," he says. "If we can extend that healthy lifespan, it could have positive effects on our culture, economy and way of life." **M**



Immune-detection of senescence (cellular aging) marker p16Ink4a in kidney sections

A AND C SHOW P16INK4A EXPRESSION IN KIDNEYS FROM KLOTHO MICE AND B AND D SHOW SAME THING OR LACK THEREOF P16INK4A IN KIDNEYS FROM PAI-1 DEFICIENT KLOTHO MICE. BRICK RED COLOR STAIN OF THE NUCLEI SHOW P16INK4A POSITIVE EXPRESSION IN A AND C AND THERE IS NONE IN PANELS B AND D.

Why are some people immune to
age-related cognitive decline?

WRITTEN BY: Nora Dunne



**U N L O C K I N G
T H E
S E C R E T S
T O
S U P E R A G I N G**

The principal investigators of Northwestern's SuperAging project are turning neurodegenerative conditions like Alzheimer's disease upside-down by studying a tiny subset of the population with remarkable memory power. Pictured (left to right): Changiz Geula, PhD, Emily Rogalski, PhD, and Marsel Mesulam, MD.



Emily Rogalski, '07 PhD, is part of a team of scientists taking a glass half-full approach to studying cognitive aging. Instead of focusing on factors that can lead to dementia and neurodegenerative disease as people grow older, they concentrate on the factors that can protect memory. They do this by investigating seniors in their 80s, 90s and beyond who have remarkable memory power, a tiny subset of the population they call SuperAgers.

"Most of the news about aging is not so great," says Rogalski, a research associate professor in Northwestern's Cognitive Neurology and Alzheimer's Disease Center (CNADC). "Your eyesight goes bad, your hair falls out, your memory gets worse. But not everybody ages that way. It's important to understand why some people are doing so much better than expected."

Definitions of successful aging vary widely, but "SuperAger" has a very specific meaning: a person age 80 or older with memory performance equal to or even better than healthy people in their 50s and 60s. To qualify, an individual must pass a rigorous set of memory tests, ones so tough that less than 10 percent of people

who believe they could be a SuperAger actually qualify. Northwestern is the only institution in the world conducting this specific type of aging research.

"We wanted to focus on people who have this extraordinary memory ability and then find out what else they have in common by studying them in a really comprehensive way," Rogalski says. "We look at psychosocial factors, education, family history, physical health and the brain."

CNADC investigators could end up with hundreds of variables to weigh against aging, but they're taking the challenge one step at a time. First they showed that SuperAgers actually exist – that anecdotal reports of unusually sharp grandmothers and great-uncles hold up under scientific scrutiny.

SUPERAGER
n

A person age 80 or older with memory performance equal to or even better than healthy people in their 50s and 60s.

**CEREBRAL
CORTEX**

Thicker than in elderly controls. About the same size as in middle-aged controls.

**SUPERAGER
BRAIN**

**ANTERIOR
CINGULATE
CORTEX**

Thicker than in both elderly and middle-aged controls.

**ECONOMO
NEURONS**

3 to 5 times more than elderly controls.

CLUES IN THE BRAIN

In 2012, Rogalski's team published research suggesting that a common side effect of aging called cerebral atrophy – a loss of brain cells that causes brain tissue to shrink – may not apply to SuperAgers. Indeed, in the study the brains of 12 SuperAgers looked less like those of their normally aging peers and more like the brains of people 30 years their junior.

MRI scans revealed that the SuperAgers had no significant atrophy in their cerebral cortex, the important outer layer of the brain responsible for memory, attention, language and thinking. Their cerebral cortex was thicker than the normal agers, about the same size as members of the middle-aged control group. Unexpectedly, the anterior cingulate cortex, a region further inside the brain that's involved in social behavior, was thicker in Super-Agers than in both elderly and middle-aged controls.

The scientists are not gathering all of this information just to find out what's interesting about being a SuperAger.

Rather, they're hoping to use it to turn conditions like Alzheimer's disease upside-down.

"We know that what goes wrong in the brain in Alzheimer's is very complex, and even though we have the brightest minds working on it all over the world, at this point we don't have an effective disease-modifying treatment," Rogalski explains. "The factors we identify could eventually become targets to go after in the laboratory to treat neurodegenerative diseases. Our MRI findings led us down a path that we never could have guessed or anticipated."

In follow-up research published in 2015, CNADC investigators studied samples of the brain under a microscope (study participants are asked to donate their brains after death to support this kind of work). The research showed that SuperAgers had fewer tangles in the anterior cingulate cortex, a compelling finding considering that these twisted fibers of protein are a primary marker of Alzheimer's disease. And compared to age-matched controls and individuals with mild cognitive impairment, SuperAgers had three to five times more von Economo neurons, a particular type of nerve cell linked to higher-order social intelligence (they're typically found only in great apes and humans).

"It is possible that SuperAgers have higher numbers of these neurons at birth and maintain this higher number throughout life," says Changiz Geula, PhD, research professor in the CNADC. "The second possibility is that von Economo neurons undergo a normal age-related

loss to which SuperAgers are immune.”

In ongoing research, Geula’s lab is studying these special cells across the lifespan to learn how they change over time and in Alzheimer’s disease.

Geula, Rogalski and Marsel Mesulam, MD, director of the CNADC, are all principal investigators of the SuperAging project, which is funded by the National Institute on Aging. Day to day, Geula handles examinations of the brain tissue samples, while Rogalski coordinates study participant enrollment and all that goes with it, from cognitive assessments to brain scans. With his “unprecedented multidisciplinary expertise,” Mesulam “is the glue that holds it all together,” Rogalski says.

“We work collaboratively to decide what are the most important questions we want to ask next and how can we answer them in our living participants and with the microscope,” she says.

HINTS BEYOND THE BRAIN

Right now there are about 60 people enrolled in the SuperAgers study. In addition to memory tests, each participant completes an IQ test, a psychosocial questionnaire and personality inventories. Some have also undergone long interviews about their lives as part of a project done in collaboration with Regina Logan, PhD, and Dan McAdams, PhD, faculty at Northwestern’s Foley Center for the Study of Lives.

“You can learn a lot about people’s lives and personalities through the way they tell stories about themselves,” Rogalski says. “And this may be tied to your brain health. A negative outlook on life could raise your stress hormones. Too much cortisol is not good for your hippocampus, and your hippocampus is important for memory.”

SuperAgers also donate blood for genetic testing – the results of which are still forthcoming – and undergo physical exams.

Rogalski stresses that the study participants represent all walks of life. The only obvious common denominator is, in fact, their memory power.

“These people don’t report being superior in school. Their educations range

from high school to advanced degrees,” she says. “And their physical health varies, too. There are people who need canes, walkers and wheelchairs and others doing yoga and weight lifting.”

Edith Smith, a former Chicago Public Schools teacher who retired in 1976, got involved in the SuperAging study about three years ago. “I’ve always had a good memory,” says the outgoing 102-year-old. “For instance, if I learned someone’s telephone number, after many, many years I still knew it.”

Her secret to great memory?

“I have no idea,” she says with a laugh. “It’s just part of being me.”

SuperAger Bill Gurolnick, however, has a theory. “I’ve been a very active person,” says the 85-year-old, who finished a 30-mile bike ride moments before his interview for this story. “When I was in my 60s I got hooked on high-impact aerobics. My theory is the oxygenation of the brain can’t hurt.”

Since joining the study about a year ago, Gurolnick, a former executive at an automotive chemical company, has enjoyed learning about how the brain works.

“My father had Alzheimer’s very early in his life,” he says. “They tell me that my memory’s pretty good, that a decline of cognitive skills is happening slower for me than for the general population. Why is that true for some and not for others? That’s what the research is all about.”

The research team will follow Smith, Gurolnick and the rest of the study’s participants as long as they can, with the goal of learning about what happens to SuperAgers over time. The investigators have already shown that these individuals maintain their superior cognitive performance over the course of 18 months – but will it last longer? And what else can be gleaned from SuperAgers?

“Hopefully what we’re starting is really a new line of investigation that can lead us to poignant insights that our labs and others can take in important directions,” Rogalski says. **M**

25 YEARS OF ALZHEIMER’S DISEASE RESEARCH

This summer, the National Institute on Aging renewed funding for Northwestern’s Cognitive Neurology and Alzheimer’s Disease Center (CNADC), marking 25 years of continuous support for the center and its research to cure and prevent the devastating neurodegenerative disease.

“Alzheimer’s disease is not only an area of tremendous need, but an area of tremendous opportunity for studying degenerative diseases and issues related to aging,” said Marsel Mesulam, MD, director of the CNADC.

The \$8.6 million grant helps finance the SuperAging project and several other studies, including:

- » Non-pharmacological interventions to increase quality of life for patients with Alzheimer’s disease as well as their families (led by research associate professor Darby Morhardt, PhD)
- » Research to identify biomarkers for the diagnosis of Alzheimer’s disease during a patient’s lifetime (led by professor Sandra Weintraub, PhD)

THINK YOU MIGHT BE A SUPERAGER OR KNOW ONE?

The SuperAging study is still enrolling participants, who must be 80 years or older and able to visit Chicago every two years for testing. Interested individuals may contact the research coordinator at 312-503-2716 or agingresearch@northwestern.edu.



LIVING AFTER CANCER

There are more than 15 million cancer survivors in the United States today. Thanks to early detection and improved treatments, that number is expected to grow to over 20 million by 2026. While these staggering numbers are cause for celebration, the flip side of the coin is that people with cancer often experience medical, psychological and social challenges long after diagnosis and primary treatment. Chronic pain, fatigue and depression from cancer treatment are not uncommon. Resuming everyday life can be an uphill battle.

A Northwestern Medicine initiative supports cancer survivors

WRITTEN BY: Janet DeRaleau

DAVID CELLA, PHD

Chair of the Department of Medical Social Sciences; developed tool to screen patients for pain, depression, anxiety, fatigue and other side effects of cancer survival

FRANK PENEDO, PHD

Roswell Park Professor of Medicine Social Sciences, Psychology, and Psychiatry and Behavioral Sciences; director of the Cancer Survivorship Institute and its research program



MONITOR AND MANAGE

"Thriving with cancer or being cured of cancer are both wonderful," says David Cella, PhD, chair of the Department of Medical Social Sciences. "But treatments often cause downstream problems that have to be monitored and managed. That's what the Cancer Survivorship Institute does."

Though many people equate survivorship with remission, the Robert H. Lurie Comprehensive Cancer Center of Northwestern University uses the term to describe patients from the time of diagnosis until the end of life. The center's Cancer Survivorship Institute (CSI), started in 2013, integrates clinical service specifically tailored to these patients with research.

"It's a clinical services and translational research hub that brings together supportive oncology clinicians and investigators from our Cancer Control and Survivorship Research Program," says director Frank Penedo, PhD, Roswell Park Professor of Medical

Social Sciences, Psychology, and Psychiatry and Behavioral Sciences.

That research program, also under Penedo's direction, includes 38 faculty members from 13 departments and two Northwestern schools. Members focus on three areas: measurement science, determinants of optimal survival and intervention science.

For example, measurement science experts in the research program have developed brief, precise and clinically validated assessments to identify patients with depression, fatigue and pain that warrant closer attention by the psychosocial and medical teams. The institute then implements the distress screening and refers supportive oncology clinical care.

Members are also developing and implementing technology-based tools using smart phones and internet-based psychosocial interventions to offer education in areas such as stress reduction and symptom management.

"These evidence-based tools are designed to enhance the survivorship experience and address specific and unique needs of cancer survivorship post-primary treatment," Penedo explains.

Northwestern Medicine is ahead of the curve in the area of distress screening, having started its process 10 years ago. Cella, a 30-year veteran in the field of cancer survivorship and outcomes measurement, was instrumental in developing the Patient-Reported Outcomes Measurement Information System (PROMIS) and implementing it at the Lurie Cancer Center. Funded under the NIH Roadmap for Medical Research Initiative, PROMIS is a cooperative network comprised of Northwestern and six other universities charged with creating a common publicly available instrument to measure patient-reported outcomes across conditions.

Cancer patients are exposed to a screenings using PROMIS measures through Northwestern’s patient portal, MyChart.

“The Lurie distress screening program is like a laboratory,” Cella says. “But we don’t draw blood and we don’t spin it and give you a platelet count. We ask questions and produce a report.”

PROMIS takes administering patient surveys to new levels with advanced technology and modern measurement theory. Applying computer adaptive testing, which is used on standardized tests such as the Graduate Record Exam, the system tailors successive questions on the patients’ last response to minimize administrative burden.

The system screens for pain, depression, anxiety, fatigue and problems with functioning. Patients are asked if they have social work needs and if they want to talk to anyone about spiritual issues, finances or their treatment. Patient results immediately populate their electronic health record and any severe symptoms

SURVIVORSHIP SUPPORTIVE SERVICES

While Cella describes the institute’s screening process as a laboratory, he says supportive services “are run like our version of precision medicine: the right treatment to the right patient at the right time.”

The CSI offers a variety of comprehensive supportive oncology services under the direction of Timothy Pearman, PhD, professor of Medical Social Sciences and director of supportive oncology. These services include counseling and emotional support, physical therapy, pain management, nutrition education and fertility support.

Sheetal Kircher, MD, ’11 GME, assistant professor of Medicine in the Division of Hematology/Oncology, is the CSI’s medical co-director and director of the survivorship specialty clinics, which offer patients specialized survivorship care and education. An important part of the clinics’ offerings is a treatment summary and survivorship care plan (SCP), which patients can share with

their primary care physicians to use during follow-up care. Since 2015, cancer centers accredited by the American College of Surgeons Commission on Cancer, including the Lurie Cancer Center, must deliver SCPs to patients completing primary cancer treatment with curative intent – patients with stage one through three and a few stage four cancers.

Sofia Garcia, PhD, ’05 GME, assistant professor of Medical Social Sciences and the CSI’s translational research program director, has developed a system that can auto-populate 80 percent of the information that goes into the care plans through drop-down menus and data pulled from an electronic data warehouse.

“Sofia has been instrumental in leading the development and integration of our SCP delivery program in the CSI clinics through foundation money she received through the Lynn Sage Cancer Research Foundation,” says Penedo, emphasizing the system as yet another way the CSI is ahead of the curve in patient services.

SUPPORTING YOUNG AND OLD

Programs targeting specific demographic groups seek to address the unique challenges of both the young and the old following cancer treatment.

The Survivors Taking Action & Responsibility program provides long-term follow-up support for adult survivors of childhood cancer. The Adolescent and Young Adult Oncology Program is designed for adolescent and young adult oncology patients facing a unique set

TIMOTHY PEARMAN, PHD

Associate professor of Medical Social Sciences and Supportive Oncology; the CSI’s director of supportive oncology

SHEETAL KIRCHER, MD, ’11 GME

Assistant Professor of Medicine in the Division of Hematology/Oncology; the CSI’s medical co-director

SOFIA GARCIA, PHD, ’05 GME

Assistant professor of Medical Social Sciences; the CSI’s translational research program director



trigger notifications to providers who can then make necessary referrals and care decisions.

“The Lurie PROMIS screening sends an immediate message to patients that we care not just about their tumor, but about how they are functioning and how they feel,” says Cella. Investigators also benefit, as they can evaluate if new or alternative treatments result in better, worse or similar outcomes than previous treatments.

“Doing this on a system-wide basis is still very new,” Cella notes. “We’re one of just a handful of places that have made this operational.”

of challenges including infertility, secondary cancers and heart conditions.

Older cancer survivors have their own unique needs: They may have comorbidities – the simultaneous presence of two chronic diseases or conditions – take multiple medications or have age-related declines. All can further compromise adjustment to the post-treatment phase of cancer survivorship.

So patients seen at the clinic benefit from tailored care plans provided by a multidisciplinary team consisting of oncologists, a geriatrician, social workers, nutritionists, psychologists and pharmacists.

“With about 60 percent of cancers being diagnosed in people age 65 and older, cancer is perceived in many ways as a disease of aging,” says Penedo. “For an elderly patient diagnosed with breast cancer, we may also be dealing with comorbidities like hypertension or diabetes. As these add up, you have a cumulative challenge on the quality of life of the person.”

Meanwhile, the CSI and Supportive Oncology Care Program are available to help cancer survivors and their loved ones with services tailored specifically to patient needs. Patients receive help managing the physical, emotional and spiritual challenges of cancer and its burden on family and caregivers.

“The organizing principle around all of our work is putting the patient in the center of what we’re here to learn, how we organize our thinking and our delivery of healthcare,” says Cella. “That’s still a novel concept.”

BRICK BY BRICK

Surviving cancer is a long and grueling battle, one that’s far from over the day a patient is declared “in remission.” Charles Chamberlain, 53, didn’t realize the support he would need to continue the battle until he met Timothy Pearman, PhD, director of supportive oncology at the Cancer Survivorship Clinic.

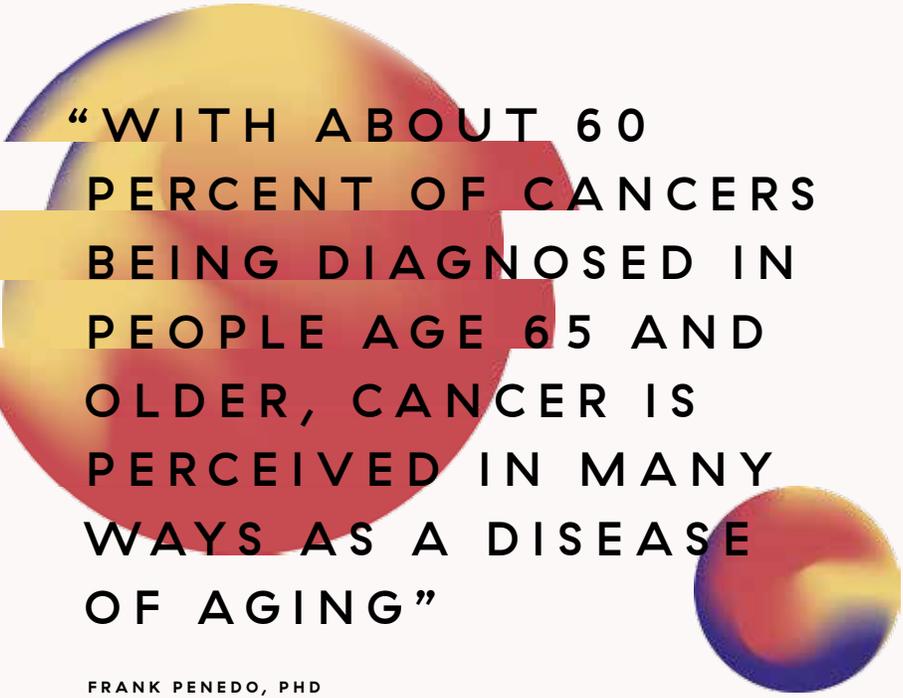
Having been diagnosed with stage four enteropathy-associated T-cell lymphoma, Chamberlain’s arduous treatment consisted of 10 months of chemotherapy and an autologous stem cell transplant at

the University of Nebraska Medical Center. Once complete, he received maintenance chemo at another hospital in Chicago, but felt that he was falling through the cracks. Acting as his own advocate, Chamberlain searched until he found Pearman, who assured him that he would not get lost in the Northwestern Medicine system.

“I needed Tim to say to me, ‘You are a brave man. You continued to persevere. It’s normal to be frustrated. Any healthy human being would be frustrated. You are not crazy,’” Chamberlain recalls.

team members to address the challenges caused by treatment: a nutritionist to take care of his gastrointestinal problems, a neurologist to help his peripheral neuropathy, and a physical therapist to help him move through atrophy and improve his balance.

Chamberlain tells the story of visiting his long-time barber in the Lakeview neighborhood of Chicago after his transplant. He had changed from a 185-pound man with an athletic build to someone with no hair weighing 130 pounds. Initially, his barber didn’t recognize him, but when he did, the



“WITH ABOUT 60 PERCENT OF CANCERS BEING DIAGNOSED IN PEOPLE AGE 65 AND OLDER, CANCER IS PERCEIVED IN MANY WAYS AS A DISEASE OF AGING”

FRANK PENEDO, PHD

Along with receiving maintenance chemo at Lurie Cancer Center, Chamberlain has been seeing Pearman once a week over the last 15 months for supportive oncology psychotherapy. He considers his work with Pearman just as important as the care he received from his oncologist.

“Both are essential,” he says. “Tim helped me move from the trauma of treatment into the growth of survivorship.”

Chamberlain credits Pearman with helping him see the need for other supportive

two men embraced, and the barber said the words that put his life into perspective: “The war is over. Now we rebuild the village.”

“That’s what I do with Tim,” says Chamberlain. “I rebuild the village.” **M**



*G.R. Scott Eudinger, MD
Pulmonary & Critical Care Medicine*



NEW DIVISION CHIEF TARGETS AGING'S IMPACT

Aging has a profound impact on the body's organs, tissues and cells. Indeed, it's the greatest risk factor for chronic lung disease and many other debilitating conditions. As the years pile up, so does a progressive decline that may begin as early as young adulthood. New chief of the Division of Pulmonary and Critical Care Medicine at Feinberg, Scott Budinger, MD, stands at the vanguard of highly collaborative research to pinpoint aging's effects and explore potential interventions at the molecular level.

"We tend to think of aging as an inevitable risk factor," says Budinger, who was appointed division chief last spring. "But what we're understanding now is that aging is a biologic program that unfolds over time. And it's something that we might be able to intervene in."

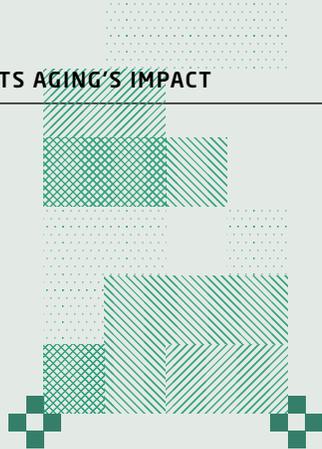
Working closely with other leading basic and clinical scientists at Northwestern, including Jacob Sznajder, MD, Navdeep Chandel, PhD, Richard Morimoto, PhD, Harris Perlman, PhD, Douglas Vaughan, MD, as well as William Balch, PhD, at the Scripps Research

Institute, Budinger aims to improve older patients' quality of life.

"Quantity of life is a potentially important goal, but the more immediate goal is aging well – increasing 'health span' rather than lifespan," explains Budinger, who is also a professor of Medicine and of Cell and Molecular Biology. His research has been continually funded by the National Institutes of Health (NIH) since 2001.

The principal investigator of a new project funded by the NIH National Institute on Aging, he is using mouse models to test whether dysfunction in the lung's proteostasis network causes age-related susceptibility to influenza A infection. This network consists of the integrated pathways within cells that regulate the proper folding and degradation of proteins, maintaining them in a functional state.

Budinger's investigation builds on research Morimoto has conducted on worms. "Rick found that after worms have their first progeny, a signal from the gamete cell triggers a systematic decline in the function of the protein-folding network



over the lifespan of the animal," he says. "We are essentially looking at the same thing in mice and in people."

At every six months in the mouse lifespan, starting at two weeks of age and ending near the point of death two years later, Budinger and his team are examining 25 different tissues, assessing the protein-folding network's functioning and attempting to extrapolate the findings to human physiology using biological computational modeling.

"Scott's work on aging is really cutting edge," emphasizes Perlman, Northwestern's chief of Rheumatology, and one of Budinger's collaborators. "He is trying to make a genetic map of aging processes in all of the tissues of the body. He is doing that in mice and he's going to translate that to patients."

At Northwestern, Budinger has been a champion of transcriptional profiling, the development of a molecular understanding of biological processes at the genome (DNA), transcriptome (mRNA), proteome and metabolic pathway levels. Says Perlman, "This is a new push for our school, and it will revolutionize a lot of the work people are doing for biopsies."

Joining the Feinberg faculty 16 years ago, Budinger, who is 51, earned a bachelor of science degree in chemical engineering from Northwestern in 1985 before attending medical school at the University of Illinois at Chicago. He completed his residency and fellowship at the University of Chicago Hospitals. His engineering background has served him well throughout his career. "It was really useful to me in

medical school and even more useful in developing a research program afterwards," Budinger shares. "Engineering is a 'how to do it' kind of field, whereas biology focuses on 'what are the right questions?' Combining both approaches is a good path to success."

ENTHUSIASTIC, GENEROUS LEADER

With some 65 published original investigations to his name, including many as lead author, Budinger is a tireless scientist. He is also a thoughtful, helpful colleague and

a valuable mentor to many trainees and faculty members.

"Besides being a great scientist, Scott is a really great person," Perlman says. "He's very giving."

For example, with an excellent track record in obtaining funding, Budinger often volunteers to critique his colleagues' grant applications. "I can't tell you how many grants he has read for

my group and other groups," says Perlman. "As late as midnight, he'll be going through your grant and really help you on it. Not a lot of people would do that."

Succeeding Jacob Sznajder, MD, who stepped down after 17 years as division chief to develop new research programs for Northwestern, Budinger plans to build on his predecessor's impressive legacy. He hopes to develop an integrated respiratory care program for patients, featuring a comprehensive center that will bring together many specialists under one roof to offer convenient, accessible care. The center would also teleconference with patients' primary care physicians.

"Rather than patients sorting through the medical system themselves, we want to provide coordinated care that is based on their disease," Budinger explains. "It takes physicians who are willing to work together. Fortunately, at Northwestern, we have very collaborative faculty who are willing to work toward a common goal." **M**

"Quantity of life is a potentially important goal, but the more immediate goal is aging well — increasing 'health span' rather than lifespan."

Scott Budinger, MD

Vital Stats

65

Original published investigations

15

Years of continuous funding by the NIH



Alumni President's Message

Composing a Career: Mentoring and Coaching



PRESIDENT BRUCE SCHARSCHMIDT, '70 MD (HPME), PARTICIPATES IN A MENTORING LUNCHEON WITH CURRENT STUDENTS AT ALUMNI WEEKEND 2016.

Dear Fellow Alumni:

For a physician managing a career, successful aging requires adapting to an environment that's changing at an increasingly rapid rate, as well as recognizing and capitalizing on the opportunities these changes afford. Rarely can one do this alone. Rather, we need the counsel and help of others: mentors and coaches.

This issue of the magazine coincides with the 25th anniversary of the 1991 founding of our Medical Alumni Association Board (MAAB), which has made mentoring a top priority. Mentoring is also a personal interest of mine¹ that began when I became chief of Gastroenterology at the University of California, San Francisco (UCSF), and it has grown in importance and scope over the course of my career. In this letter, I'll touch on several issues related to mentoring that are not often addressed.

Mentoring vs. coaching: Mentors cannot be all things to their mentees; there are times when specific training or coaching may be required to teach a particular skillset. In contrast with a successful mentor-mentee relationship, which typically matures and evolves over years, coaching can be temporary, as short as one or two sessions. Understand the difference and seek coaching when you need it.

Personal characteristics may be career limiting and tough to change: As physicians, scientists and healthcare professionals, we work daily with very bright and dedicated colleagues. I can remember few trainees or co-workers in academia or industry who were limited in their careers by inadequate intellect. By contrast, many bump into career limitations as a result of poor interpersonal or communication skills and/or a lack of overall effectiveness, such as the ability to bring projects or issues efficiently and smoothly to fruition or resolution. The paradox here is that personal characteristics are

often the most important yet also often the most difficult to confront and deal with. There is no silver bullet that applies here. Rather, in my experience, addressing personal characteristics and behavioral issues takes courage, hard work, sensitivity and a sincere willingness of both the mentor and mentee to engage, often with the help of a skilled coach, in a spirit of mutual trust

“Most mentors find that mentoring is a rich source of continuing discovery and excitement, and it is precisely for this reason that our MAAB has made mentoring a top priority.”

and goodwill. It also takes patience, persistence and continued coaching focused on real-life interactions and encounters of the mentee rather than abstract concepts.

Mentees are often the best teachers: Robert S. Brown, Jr., MD, MPH, Gladys and Roland Harriman Professor of Medicine and clinical chief of Gastroenterology and

Hepatology at Weill Cornell Medicine, was a GI trainee at UCSF, where he worked in my laboratory. During his training, Bob wrote a short piece on mentoring, which included ten commandments for mentors and mentees. His guidelines are so good that I have kept them for over 20 years and reproduced them here with his permission.

Separation anxiety: There often comes a time when mentees need to separate from their mentors, or at least pursue a different type of relationship where they interact as peers and colleagues. This is not always easy. It can be difficult for the mentee to leave the comfort and shelter of a senior colleague, who may also help to provide funding and support. And it can be even more difficult for the mentor, particularly if the accomplishments for which the mentor is recognized and on which his or her research funding or professional stature are based, represent, in part, the work of the mentee. Anticipate these transitions and address them proactively.

The roles of mentor and mentee are lifetime endeavors: As an early graduate of the Honors Program in Medical Education (HPME) in 1970, I was under the titanic misconception that my need for mentoring would largely end coincident with post-graduate training and my first real job. Now, approaching my 50-year reunion and having navigated several career transitions – from NIH physician-scientist, to NIH-funded academic investigator, to academic medical subspecialty division chief, to medical journal editor, to professional society president, to “big biotech” and then “big pharma” VP, and, most recently, to chief medical and development officer at a small biotech startup where we successfully developed and launched a product for a rare metabolic disorder, completed an initial public offering and then were acquired – I have benefitted enormously and repeatedly from the counsel and mentoring of others.

Our continued survival as physicians in practice, academia or business, as scientists in academic and nonacademic settings, as parents and, indeed, as a human species, depends on our ability to conceive, nurture and effectively equip the next generation. It is a primal force that binds us. Most mentors find that mentoring is a rich source of continuing discovery and excitement, and it is precisely for this reason that our MAAB has made mentoring a top priority. Please let us know if we can help and/or if you would like to get involved.

Sincerely,
 Bruce Scharschmidt, '70 MD (HPME)
 Medical Alumni Association Board President

¹Scharschmidt, B. “Mentoring: A personal perspective from academia and industry.” *Gastroenterology*. 2015; 148:276-9.

10 Commandments of Mentoring

FOR THE MENTOR		FOR THE MENTEE
Be a role model	1	Take initiative
Be an advocate	2	Choose a role model
Be enthusiastic and encouraging	3	Find a niche
Critically evaluate projects and career goals	4	Look for compatible interests and communication styles
Encourage individuality and differentiation	5	Define your projects and role
Guidance, not ownership	6	Think big
Focus, focus, focus!	7	Focus on concepts/ techniques as well as topics of study
Take the long view	8	Focus, focus, focus!
Push the limits	9	Seek advice
Market your product	10	Shop around

Progress Notes

'40s

Happy birthday to Margaret Gerber, '44 MD! She turned 100 on November 14.

William Hobbins '48 MD, of Fitchburg, Wis., received the first Thermography Lifetime Achievement Award from the American Academy of Thermology in 2012.

'50s

Nicholas J. Demos, '54 MS, '55 MD, '58 GME, retired from his surgical career in 2013. He writes, "As a professor at the University of Medicine and Dentistry of New Jersey (now Rutgers School of Biomedical and Health Sciences), I have been teaching medical students about my over-50 years of experience. Moreover, I continue my hobby, painting."

LEFT: PAINTING OF THE OLYMPIC FLAME BY NICHOLAS J. DEMOS, '54 MS, '55 MD, '58 GME. RIGHT: WILLIAM "JACK" FRABLE, '59 MD, '60, '64 GME, IN HIS HOME STUDIO IN RICHMOND, VA.



William D. Pletcher, '55 MD, of Elkhart, Ind., retired in December 2014 after a career in medicine. His first wife died in 1998, and he remarried in November 2005. Pletcher has four children – including two in the medical field – and 18 grandchildren.

William "Jack" Frable, '59 MD, '60, '64 GME, of Virginia is a retired pathologist and an avid painter, focusing on watercolors.

'60s

Above, on right: Three generations of the Steelberg family, all Northwestern University alumni, gathered at the school's commencement in June. Below, from left, Donald Steelberg, Connor Steelberg, Elsie Enns Steelberg, '60 MD, '64 GME, Derek Steelberg and Maria Vignali Steelberg.



Michael L. Friedman, '67 MD, of Rancho Palos Verdes, Calif., works in Obstetrics and Gynecology in the UCLA Health System after 41 years in private practice in Torrance, Calif. He supervises two younger doctors and is enjoying life without the stress of running a private practice. Some of his patients have been coming to him for more than 35 years.

Trent W. Nichols, '69 MD, '76, '78 GME, internist, nutritionist and gastroenterologist, was one of the keynote speakers at the 2nd International Conference on Hepatology, held May 9-11 in Chicago. He presented his research "Wnt signaling in hepatocellular carcinoma, an emerging epidemic: Gene up regulation of Wnt 5a pathways with toll receptor 4 with moderated magnetic fields on human stem cells and mice and high dose vitamin D3 prevention." His experience with liver disease at Martinsburg VA Medical Center, W.Va., provided this background. He is currently chief medical officer for Lumenau, a new biotech company for photonic therapy.

'70s

Demetrios Velis, '79 MD, of Amsterdam, became the senior attending neurologist and clinical neurophysiologist at Free University Medical Center's Comprehensive Epilepsy Program in February.





KENNETH HEIFERMAN, '82 MD, '88 GME, WITH KIM HEIFERMAN, RN, AND PAUL SACKS, '82 MD.



HELENA GABRIEL, '89 MD, '94 GME, CATCHES UP WITH FRANK KRUMLOVSKY, '62 MD, '68 GME, VINCE FREEMAN, MD, MPH, AND RICHARD WONG, MD.

'80s

Paul Sacks, '82 MD, writes, "Just turned 60 a few weeks ago and starting to think about some moderation. I don't think I could handle the subzero temperatures along Lake Shore Drive anymore. It was once so cold that we took a cab from the Lake Shore Club to the Ward Building. There is not much snow down here in Phoenix, but I could do without the 119-degree days that we recently experienced. I miss my NUMS days so much. Just spent some time with Kenny Heiferman, '82 MD, '88 GME, down here and have been able to catch up with Kathy Tuttle, '82 MD, '85 GME, every few years when I see her at the renal meetings.

Larry Kwak, '83 MD, '84 PhD, of Duarte, Calif., is vice president and cancer center associate director for developmental therapeutics and translational research at the City of Hope National Medical Center. He received the 2016 Ho-Am Prize in Medicine. The prize, widely considered the equivalent to the Nobel Prize in Korea, is awarded in the fields of science, engineering, medicine,

arts and community service. Kwak was recognized for his research on immunology and therapeutic cancer vaccines.

Tapan K. Daftari, '88 MD, and Byron D. Rosenstein, '82 MD, were named to the 2016 list of Top Doctors in *Atlanta* magazine's July issue.

Helena Gabriel, '89 MD, '94 GME, associate professor of Radiology at Feinberg and director of the School of Ultrasound, writes, "In 1988, when I was a fourth-year Northwestern medical student doing my sub-internship in internal medicine, we had a fantastic team consisting of Frank Krumlovsky, '62 MD, '68 GME, as the attending, Dr. Vince Freeman as the resident, Dr. Richard Wong as the intern, and myself as the fourth-year medical student. We had such a wonderful time together that we kept in touch in the form of an annual dinner. Well, this annual dinner has now continued for 28 years. Who would have thought that a six-week sub-internship

would result in such strong, wonderful friendships with such longevity!"

'90s

Daniel Ivankovich, '95 MD, '02 GME, an orthopaedic surgeon, and his team at the OnePatient Global Health Initiative perform more than 600 surgeries a year, working with 14 inner-city hospitals in Chicago's poorest neighborhoods to provide medical care to anyone who needs it, regardless of ability to pay. The American Red Cross honored him with a 2016 Community Impact Award for that work.



Aaron Gerber, '96 MD, former partner at Oliver Wyman, was appointed president of Sg2, a developer of analytics-based health-care intelligence.

David Y. Kan, '99 MD, associate chief of service for quality improvement and assurance joined Bright Heart Health as medical director of the national Rapid Access Opioid Use Disorder Program.

'00s

Jennifer Best, '00 MD, associate professor of Medicine at the University of Washington, was awarded a research grant from the Joan F. Giambalvo Fund for the Advancement of Women. The fund was established by the American Medical Association (AMA) to recognize influential women physician leaders. Best is a principal investigator of a study evaluating the impact of parental leave on resident trainees.

Cassie Kuo, '06 MD, was appointed chief of Anesthesia at Kaiser Permanente, Northern Virginia.

Cristin D. Subramaniam, '09 MD, joined Bayshore Ophthalmology.

'10s

Mazen Albaghdadi, '11 MD, '13 MS, '15 GME, traveled to Tanzania to help train local cardiologists in the performance of percutaneous coronary intervention at the only cardiac catheterization laboratory in the country. As a volunteer with the non-governmental organization Madaktari, he

supported capacity building efforts at the Jakaya Kikwete Cardiac Institute to develop local invasive cardiology services. He also participated in ceremonies recognizing the first Sub-Saharan chapter of the American College of Cardiology and met the former president of Tanzania, Jakaya Kikwete. Below: Mazen Albaghdadi, '11 MD, '13 MS, '15 GME (third from left), with colleagues in the cardiac catheterization laboratory of the Jakaya Kikwete Cardiac Institute.

GME

Ivan Ciric, MD, '66 GME, emeritus professor of Neurological Surgery at Feinberg, recently published a memoir titled *Listen To The Patient, Of Life and Neurosurgery*. Ciric weaves together the story of his life that brought him from a continent and an ocean away to the United States and the meaning, secrets and ethical aspects of neurosurgery, including the unique privilege and daunting responsibility of navigating through the human brain. Through a series of patient stories and



operations, he describes the steps leading up to a neurosurgical procedure for a number of neurologic maladies and shares the intricate details and majestic beauty of brain and spinal cord operations in an easy to understand prose. The book has received numerous salutary reviews.

Gregory Pearl, MD, '85, '86 GME, of Dallas, a vascular surgeon at Texas Vascular Associates, was appointed medical adviser at Top10MD, a service that connects patients with top physicians. He will contribute to the Top10MD medical advisory board as the company expands across the country.

Andrew Haig, MD, '86 GME, of Ann Arbor, Mich., joined Mary Free Bed Rehabilitation Hospital in February as vice president of accountable care



and medical informatics. He is responsible for developing accountable and value-based care strategies for the hospital's business and 26 network partners. Haig is professor emeritus of Physical Medicine and Rehabilitation at the University of Michigan and president of Haig et al. Consulting. He is a recognized rehabilitation expert with a clinical focus on spinal disorders, electrodiagnosis of nerve diseases and cancer rehabilitation.

Bulbul Bahuguna, MD, '90 GME, a psychiatrist with NorthShore University Health Systems, has been chosen as an Expert Network Distinguished Doctor, based on peer review, in addition to receiving numerous recognitions and accomplishments throughout her career.

Mary Howell, MD, '90 GME, was named to the International Association of Health-Care Professionals.

Wesley Gene McNeese, MD, '90 GME, was named associate dean for diversity and inclusion at Southern Illinois University School of Medicine. He also is an



associate professor of Internal Medicine and Medical Humanities.

Angela Lima, MD, '94 GME, recently joined Kaiser Permanente as a psychiatrist in Northern California, Central Valley Area, after many years of private practice in the Chicago area. She writes that she loves the weather.



Lance W. Coleman, MD, '97 GME, previously senior medical director with Blue Cross of Idaho, joined health management solutions firm Lumeris as the medical director.

Prerak Shah, MD, '98 GME, associate staff at Massachusetts Eye & Ear Infirmary and

clinical instructor at Harvard Medical School, was a Northwestern pediatric resident from Children's Memorial Hospital prior to changing career paths into Otolaryngology. He was recently named to the board of directors of the Massachusetts Society of Otolaryngology – Head & Neck Surgery for a two-year term and reappointed to the Endocrine Surgery Committee of the American Academy of Otolaryngology – Head & Neck Surgery. Shah brought his eldest son for a college visit to Evanston this year, and they took in a basketball game together. He says, "Go Cats!"

Sheila E. Bloomquist, MD, '04 GME, of Madrid, was married to Cayetano Martínez Beltrán, in Gibraltar, Spain, on March 18, 2016.

Eve C. Feinberg, MD, '04 GME, medical director of Fertility Centers of Illinois, was

named medical director of Northwestern Medicine Fertility and Reproductive Medicine Highland Park.

Amit T. Darnule, MD, '08 GME, was named to the Rising Stars Super Doctors publication.



Blake R. Barker, MD, '10 GME, and **Kim Do Barker, MD, '11 GME**, welcomed Benjamin Bao Barker on April 19, 2016. Blake is the internal medicine clerkship director at UT Southwestern Medical Center in Dallas. Kim, also at UT Southwestern, is residency program director for the Department of PM&R.

PT

Nathan Rudin, '95 MS, MD, was promoted to professor of Orthopedics and Rehabilitation medicine at the University of Wisconsin-Madison School of Medicine and Public Health. He continues to practice at the UW Health Pain Clinic. He recently completed terms of service as president of the Midwest Pain Society and president of the Medical Staff Board of UW Hospital and Clinics. Currently he heads a task force to unify orientation for new providers across UW Health. His eldest daughter is starting medical school this fall!

DDS

John Luther, '81 DDS, joined Western Dental & Orthodontics as chief dental officer in August.



QUESTIONING END-OF-LIFE CARE

Since 1983, the Medicare hospice benefit has afforded millions of Americans the opportunity to have end-of-life care provided to them at home, surrounded by their loved ones. The explosive growth in the number of hospice providers over the past several decades can be explained by this government payout, as well as by a surprising lack of industry oversight otherwise uncommon in the U.S. healthcare system. For most of us, the process of choosing a hospice usually gets pushed to the last possible moment, when both patient and family are stressed by illness, finances and the mechanics of caregiving. It isn't surprising, then, that we delay thinking about which hospice to utilize until we aren't in the proper frame of mind to make an informed decision on our own. What is surprising is how critical this decision can be.

There is no ranking system for hospices, no Yelp or TripAdvisor for people to discuss their experiences. Individual hospices occasionally have websites but rarely publish reviews. This not only speaks to the difficulty of comparing available organizations, it also reflects the lack of published quality measures. And because the dead rarely bring lawsuits, negligent care often goes unreported. Word of mouth recommendations are often all we have to rely upon.

My own experiences attest to the pronounced changes in the hospice industry over the past two decades. I am an anesthesiologist who has attended the deaths of three family members in hospice over the past seventeen years. My clinical skills proved valuable in this setting.

In 1998, my father died from lung cancer. He passed at home, surrounded by family, which was exactly what he wanted and had planned for. We worked with a nonprofit hospice organization through the local hospital where he had received his cancer care. We dealt with one hospice nurse and the experience was positive, given the circumstances.

Twelve years later, when my mother died from dementia, she was also at home and surrounded by loved ones. But there the similarities ended. We dealt with more than a dozen nurses from a for-profit, non-accredited hospice. They provided the stuff she needed. There was little actual "care." The best I can say is that they didn't interfere ... much.

Then, in October 2015, I spent three days with my



WRITTEN BY

Margaret Overton, '83 MD, '87 GME

brother-in-law as he died from prostate cancer. Larry asked me to make him comfortable, as I had my parents. With just two options in their area, Larry and my sister had chosen one of the largest hospice

care providers in the country, a publicly traded company. If you don't think this makes a difference, spend some time looking up whistle-blower lawsuits and U.S. Department of Justice investigations brought against for-profit hospice chains.

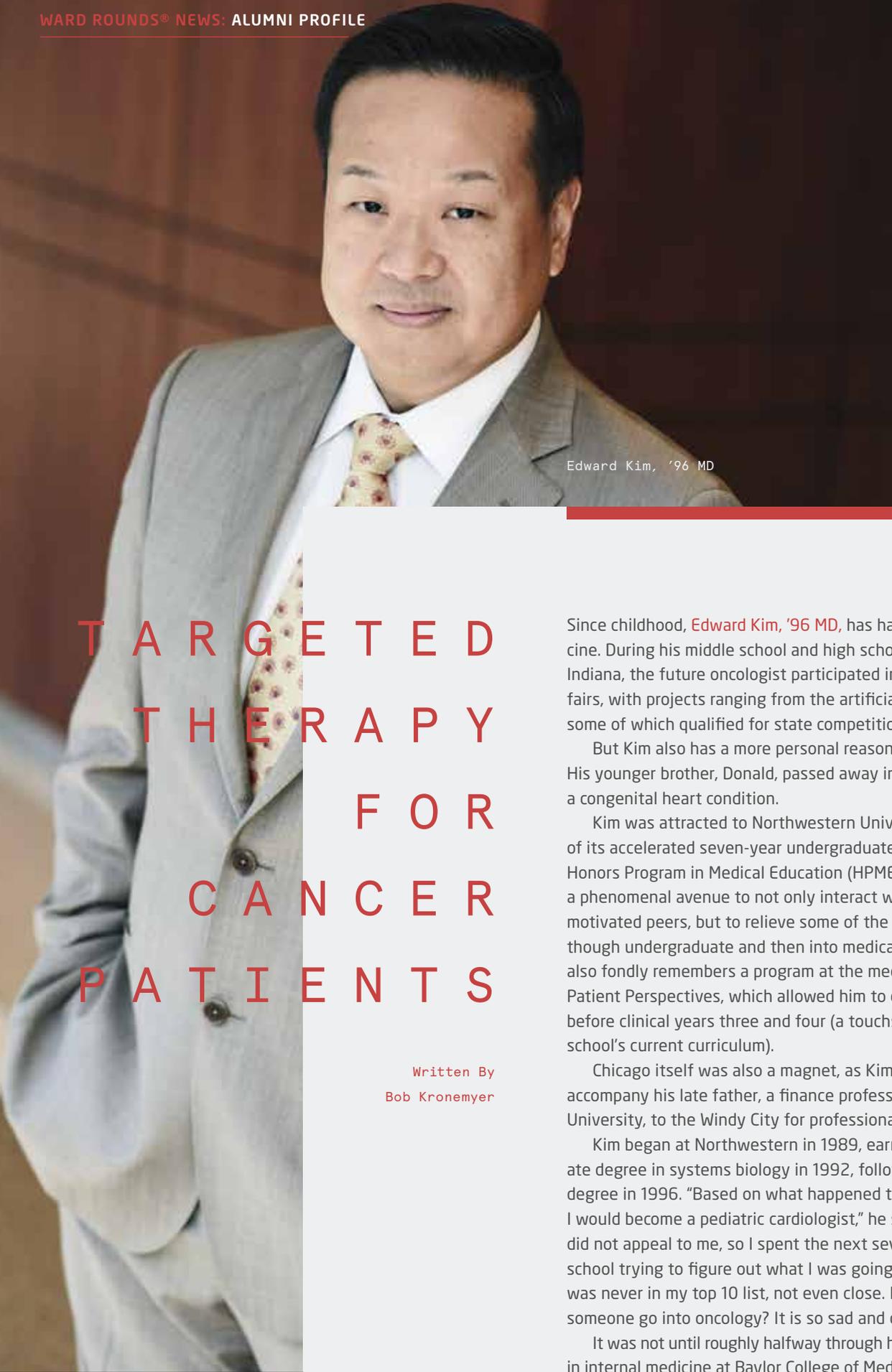
Larry's final days were very challenging. He had terrible pain, difficulty breathing and swallowing, and significant anxiety. He couldn't lie down or sleep. Tailoring a medication regimen for him required creativity. The company provided the drugs I asked for, though not in the correct dosages. And then they made it nearly impossible to administer the medications effectively.

The mission of hospice, which is to ease the pain and suffering of the dying and allow them to pass at home, with loved ones nearby, is not aligned with securitization or the rights of stockholders. It just isn't.

I don't know exactly what we owe patients or parents or family members, but I believe the healthcare system owes every American this: the right to die at home, as comfortably as possible. It's what I would want. This doesn't mean someone has to profit. That does not have to be the American way. Not every industry is better when it is profit-driven.

The *Washington Post* created a Consumer Guide to Hospice in December 2014. Most states publish an online guide to hospices. You can choose among organizations to find one that is voluntarily accredited, well-established and preferably nonprofit. Just knowing what is available is the best way to get started. Many hospice organizations are excellent, but it takes some research to figure out which ones they might be, so that when your loved ones need hospice care, they get the care you would want.

Margaret Overton recently published a memoir about end-of-life care called Hope For a Cool Pillow. IM



Edward Kim, '96 MD

T A R G E T E D
T H E R A P Y
F O R
C A N C E R
P A T I E N T S

Written By
Bob Kronemyer

Since childhood, **Edward Kim, '96 MD**, has had a calling for medicine. During his middle school and high school years in Terre Haute, Indiana, the future oncologist participated in numerous science fairs, with projects ranging from the artificial heart to cholesterol, some of which qualified for state competition.

But Kim also has a more personal reason for pursuing medicine. His younger brother, Donald, passed away in 1984 at age 12, due to a congenital heart condition.

Kim was attracted to Northwestern University mostly because of its accelerated seven-year undergraduate/medical degree Honors Program in Medical Education (HPME). "For me, HPME was a phenomenal avenue to not only interact with highly talented and motivated peers, but to relieve some of the pressure of grinding through undergraduate and then into medical school," he says. He also fondly remembers a program at the medical school called Patient Perspectives, which allowed him to engage with patients before clinical years three and four (a touchstone of the medical school's current curriculum).

Chicago itself was also a magnet, as Kim would frequently accompany his late father, a finance professor at Indiana State University, to the Windy City for professional conferences.

Kim began at Northwestern in 1989, earning an undergraduate degree in systems biology in 1992, followed by his medical degree in 1996. "Based on what happened to my brother, I thought I would become a pediatric cardiologist," he says. "However, that did not appeal to me, so I spent the next several years in medical school trying to figure out what I was going to do. Still, oncology was never in my top 10 list, not even close. I thought, why would someone go into oncology? It is so sad and depressing."

It was not until roughly halfway through his first year of residency in internal medicine at Baylor College of Medicine in Houston, during



Kim with his wife Florence (above) and their two children, Elyssa and Alex (below).

an oncology rotation, that Kim “flipped the switch.” He dealt with people on a very personal basis and to this day vividly recalls three patient encounters. “To me, oncology provided a refreshing perspective from cancer patients on how they viewed life,” Kim observes.

After completing his three-year residency at Baylor in 1999, Kim literally walked across the street to The University of Texas MD Anderson Cancer Center to pursue his fellowship in medical oncology, which he completed in 2001. Kim was then immediately hired as an assistant professor in the Department of Thoracic/Head and Neck Medical Oncology at MD Anderson. Through the years, he was promoted to an associate professor with tenure and appointed chief of Head and Neck before transferring in 2012 to his current position as chair of Solid Tumor Oncology and Investigational Therapeutics at Levine Cancer Institute, Carolinas HealthCare System, in Charlotte, North Carolina.

Levine Cancer Institute’s formation in 2012 happened to coincide with not only Kim’s appointment as chief, but also the beginning of the Donald S. Kim Distinguished Chair for Cancer Research, which is held by Kim himself. “I requested the establishment of an endowed chair in memory of my brother,” he says.

When Kim entered the field of lung, head and neck cancers, the biggest challenge was the limited number of effective therapies. “There has been a complete transformation, especially for lung cancer, over the past 10 years,” he conveys. “When I started, all patients were given just chemotherapy. But now for lung cancer we test each tumor individually, look for tumor markers and match appropriate drugs to these markers, as opposed to a shotgun approach. In fact, some of these markers are actually pills that can be taken and are more effective than chemotherapy.”

Kim’s own research has helped instigate these changes. His resume includes publications in *Lancet*, *Cancer Discovery*, *Lancet Oncology*, *Nature Reviews*, *Journal of Clinical Oncology*, *Journal of the National Cancer Institute* and *JAMA Oncology*.

Kim is excited about matching the appropriate drug to an individual patient, predicated on the look of that patient’s tumor markers. Such precision medicine spans oral treatment, immunotherapy and chemotherapies. “There is so much focus in oncology about the drug; however, if the drug does not match the patients’ tumor, we are ignoring the most important aspect, which is the individual patient and what the genetics look like in their tumor,” he explains. “Everything needs to come from the patients. They are the greatest resource we have.”

At Levine Cancer Institute, a 650-gene assay is ordered on patients to identify any potential tumor biomarkers. “This will

inform the clinician to either treat the patient with a specific drug or direct the patient to a clinical trial,” Kim says.

For solid tumor oncology, Kim says it is important not only to investigate the patient’s tumor and associated genes, but also to assess the patient’s blood, urine and other parts of the body “to appropriately identify new markers and new therapies.” For instance, only one in five lung patients currently match for targeted treatment. “Hopefully, in the next 10 years, two in five patients or three in five patients will match,” Kim said.

When he’s not working, Kim stays active – he’s been playing tennis since seventh grade and was a varsity cheerleader at Northwestern from 1989 to 1990. In addition, “I am still a Cubs fan and a long-time Bears fan, as well as heavily support the Carolina Panthers here locally,” he says. Kim’s wife, Florence, is a psychiatrist, and the couple has two children: daughter Elyssa, 15, an aspiring golfer and stage performer, and son Alex, 11, who enjoys tennis and taekwondo. **M**



Mission to Keep Seniors at Home Keeps Alumna Home at Northwestern



WRITTEN BY
BRIDGET KUEHN

Caring for seniors has always been a part of life for Lee Lindquist, '00 MD, '03, '05 GME, '05 MPH, '10 MBA. As a child, she helped care for her grandparents and many great uncles and great aunts. She and her parents would mow their lawns, make sure they had food and visit them in nursing homes to make sure their needs were met.

Lindquist is pictured in 2004, shortly after publishing a study about cruise ship care for seniors. The research, which she conducted during her fellowship, gained international attention.

"I love old people," says Lindquist, now an associate professor of Medicine at Northwestern and a physician at Northwestern Memorial Hospital. "It's a way of life, a mission. These are the people who have helped us before and it's our turn to help them."

That passion brought Lindquist to Northwestern as a first-year medical student in 1996 and has kept her here for two decades. She has risen through the ranks to lead Northwestern Geriatrics as section chief, as well as become a nationally recognized researcher in geriatrics.

"The seniors and people here are great to work with," Lindquist explains. "I keep learning new things and finding fantastic inspiration to help our seniors nationally."

After medical school, Lindquist completed her residency in internal medicine at Northwestern and then stayed to pursue a fellowship in geriatrics and internal medicine research.

It wasn't long before Lindquist got a taste of the impact she could have through research. She published a study during her fellowship that showed living on a cruise ship could be a cost-effective alternative to assisted living. The study quickly made international headlines and was highlighted in more than 200 media outlets. Officials from other countries, including Mexico, Italy, Canada and Netherlands, reached out to her for help with their nation's aging population.

"It's just mind blowing how much your research can impact the world," she says. "One morning you're seeing patients in your geriatrics clinic at Northwestern and then that afternoon, you're talking to people in Amsterdam about their long-term care issues."

Currently, Lindquist's work focuses on keeping seniors at home. She and her colleagues have developed a website called Planyourlifespan.org to help seniors anticipate what they will need in order to stay in their homes as they age.

"It's the best place for them," Lindquist explains. However, many seniors living at home face frequent emergencies. Their families often come to her concerned about their loved ones' well-being and unsure about the next steps in their care.

"We're seeing so many seniors and aging parents living on a cliff," she says. "They are doing okay right now at home, but at any minute they could fall off and have serious needs."

Rather than just reacting to these inevitable emergencies, Lindquist and her colleagues designed the website to help seniors prepare before they happen. For example, they can plan for the likelihood of a future hospitalization. They can choose a rehabilitation facility or home caregiver company in advance to ease their transition back home after a hospitalization. They can share their detailed plans with family or friends.

"A lot of people have given us feedback that the website has decreased their anxiety and stress about something

"These are the people who have helped us before and it's our turn to help them."

happening, because they have a plan," Lindquist said.

With a \$1.8 million grant from the Patient-Centered Outcomes Research Institute, Lindquist tested the website and

found that seniors who used it were more likely to make and share their plans than seniors who used a control website. The results were so resoundingly positive that the team was able to conclude the study early at the interim analysis. Lindquist has recently presented the study in grand rounds across the country and at the opening plenary session of the Society of General Internal Medicine's annual meeting, something she called a "once in a lifetime opportunity."

"It's all about trying to get people to plan for what they might need when they reach their 70s, 80s and 90s," she says. "By preparing, people have a better chance of staying in their own home."

In addition to her research, Lindquist has helped Northwestern Memorial develop a national reputation in geriatrics. The hospital was recently ranked 9th in the country for geriatrics by *U.S. News and World Report*. It was the first time the hospital has made it into the top 10. To keep that reputation going, Lindquist and colleagues are working on many clinical geriatrics programs. For example, she helps train geriatric nurses in the hospital emergency department to treat older adults and transfer them back home for follow-up care, sparing them a potentially harmful hospitalization. She is also overseeing a new effort to have physicians visit older patients at home.

For Lindquist, who set out with a "Midwestern" drive to make a difference locally, seeing her work's national and international reach has been gratifying.

"It totally surpasses any goals I've ever had," Lindquist says. **M**

Lindquist with her husband Paul, daughter Lexi and son Leo.



In Memoriam

Otis G. Beck, '47
DDS, of Tallahassee,
Fla., died April 1.

Robert E. Berktold,
MD, '79, '81, '82
GME, of Chicago,
died May 31.

Robert T. Boiley, '52
DDS, of Elgin, Ill.,
died Feb. 14.

Denise C. Cantwell,
MD, '94 GME, of
Knoxville, Tenn.,
died June 14.

Robert W. Carton,
'46 MD, of Winnetka,
Ill., died Aug. 15.

Phillip O. Dahl, '51
MD, of Bismarck,
N.D., died Jan. 9.

Jack J. Davis, '48 MD,
of Salt Lake City,
died Aug. 12.

Irby C. Dawson, '52
DDS, of High Point,
N.C., died April 3.

John Elsen, '46 MD,
of Three Lakes, Wis.,
died June 2.

Patrick H. Garvin,
'58 DDS, of Batavia,
Ill., died March 23,
2015.

Elizabeth Marie
Giometti, '96 MSPT,
of Chicago, died
July 20.

Scott Jay Greene, '78
MD, of Northbrook,
Ill., died July 25.

Ned M. Grove, MD,
'61 GME, of Hillsbor-
ough, Calif., died
June 14.

Alex N. Gunn II, '62
MD, of Sacramento,
Calif., died March 11.

Robert N. Heyburn,
'59 MD, of Flossmoor,
Ill., died July 11.

Allan C. Hoekzema,
'65 MD, '71 GME, of
Grand Rapids, Mich.,
died Jan. 2.

Thomas A. Hoyt, MD,
'78 GME, of Bryan,
Texas, died Aug. 18.

John D. Hutchinson
Jr., '74 DDS, of Fort
Walton Beach, Fla.,
died Feb. 11.

Frank R. Johnson, '47
MD, of Woodstock,
Ill., died July 30.

Lowell Johnson, '57
MD, '61 GME, of
Barrington, Ill., died
Jan. 18.

D. James Koenig, '56
MD, associate
professor emeritus
of Medicine at
Feinberg, of
Northbrook, Ill., died
May 20.

M. Steurer McKendry,
'51 MD, of Joliet, Ill.,
died July 22.

Daniel Lewis Menis,
'87 MS, '91 PhD, of
Indianapolis, died
Nov. 30, 2015.

Charles A. Speas
Phillips, '47 MD, of
Greensboro, N.C.,
died May 9.

Randall W. Powell, MD,
'78 GME, of Mobile,
Ala., died July 24.

Gregory M. Reich,
'74 DDS, '76 MS, of
Palm Desert, Calif.,
and Colorado
Springs, Colo., died
Feb. 8.

Robert E. Richter,
'59 MD, '65 GME, of
Santa Monica, Calif.,
died May 29.

Joseph E. Roberts,
'56 MD, of Asheville,
N.C., died July 23.

William B. Rydell Jr.,
'57 MD, of Beaverton,
Ore., died Nov. 24,
2015.

Ernest T. Sarver Jr.,
'63 DDS, of Caldwell,
Idaho, died Feb. 25,
2015.

John J. Sheehan, '56
DDS, of Horseshoe
Bay, Texas, died
Feb. 3.

Kenneth E. Stosich,
'54 DDS, of Idaho
Falls, Idaho, died
March 10.

Robert C. Strunk, '68
MD, of St. Louis,
died April 28.

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

Gordon S. Taylor, '58
DDS, of Payson,
Utah, died Jan. 8.

Roger N. Wassink, '57
MD, '63 GME, of Ada,
Mich., died Jan. 9

Upcoming Events

DEC

DECEMBER 3-4, 2014

Lurie Cancer Center Multidisciplinary Head and Neck Cancer
Symposium

Prentice Women's Hospital, Conference Room L
250 E. Superior St., Chicago
Details at 312-695-1391 or cancer.northwestern.edu

DECEMBER 6, 2016

The Subthalamic Nucleus: From Bench to Bedside in Parkinson's
Disease

McGaw Pavilion, Daniel Hale Williams Auditorium
240 E. Huron, Chicago
Details at 312-503-1687 or physio.northwestern.edu

JAN

JANUARY 25, 2017

Sex Inclusion in Biomedical Research Workshop & Symposium

Prentice Women's Hospital
250 E. Superior St., Chicago
Details at 312-503-1385 or womenshealth.northwestern.edu

JANUARY 26, 2017

Integrative Medicine Grand Rounds: Nutrition Education and
Research In an Era of Global Obesity and Diabetes

Robert H. Lurie Medical Research Center, Baldwin Auditorium
303 E. Superior St., Chicago
Details at 312-926-1865 or feinberg.northwestern.edu/sites/ocim

FEB

FEBRUARY 16, 2017

Alzheimer's Disease Seminar: Update from the Alzheimer's
Association Medical & Science Team

Robert H. Lurie Medical Research Center, Baldwin Auditorium
303 E. Superior St., Chicago
Details at 312-908-9023 or brain.northwestern.edu



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Progress on the Simpson-Querrey Biomedical Research Center

In May 2015, Northwestern University broke ground on its largest single construction project to date, the Louis A. Simpson and Kimberly K. Querrey Biomedical Research Center. Visit magazine.nm.org to see how the building is beginning to take shape.



School of Pharmacy Launched 130 Years Ago

On October 1, 1886, the School of Pharmacy of Northwestern University opened its doors. It went on to graduate more than 2,000 students during 30 years of operation. The school's 1910/1911 catalog highlighted scientific training in pharmacy, chemistry, and drug and food analysis, plus special courses for drug clerks, while the 1911/1912 catalog mentioned that the value of equipment used exclusively for the students of pharmacy was over \$25,000 or "five times the amount required of the Registered Schools of Pharmacy." Read more about the evolution of the program in the magazine's history blog at magazine.nm.org.



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