

Outlook

SUMMER 2018

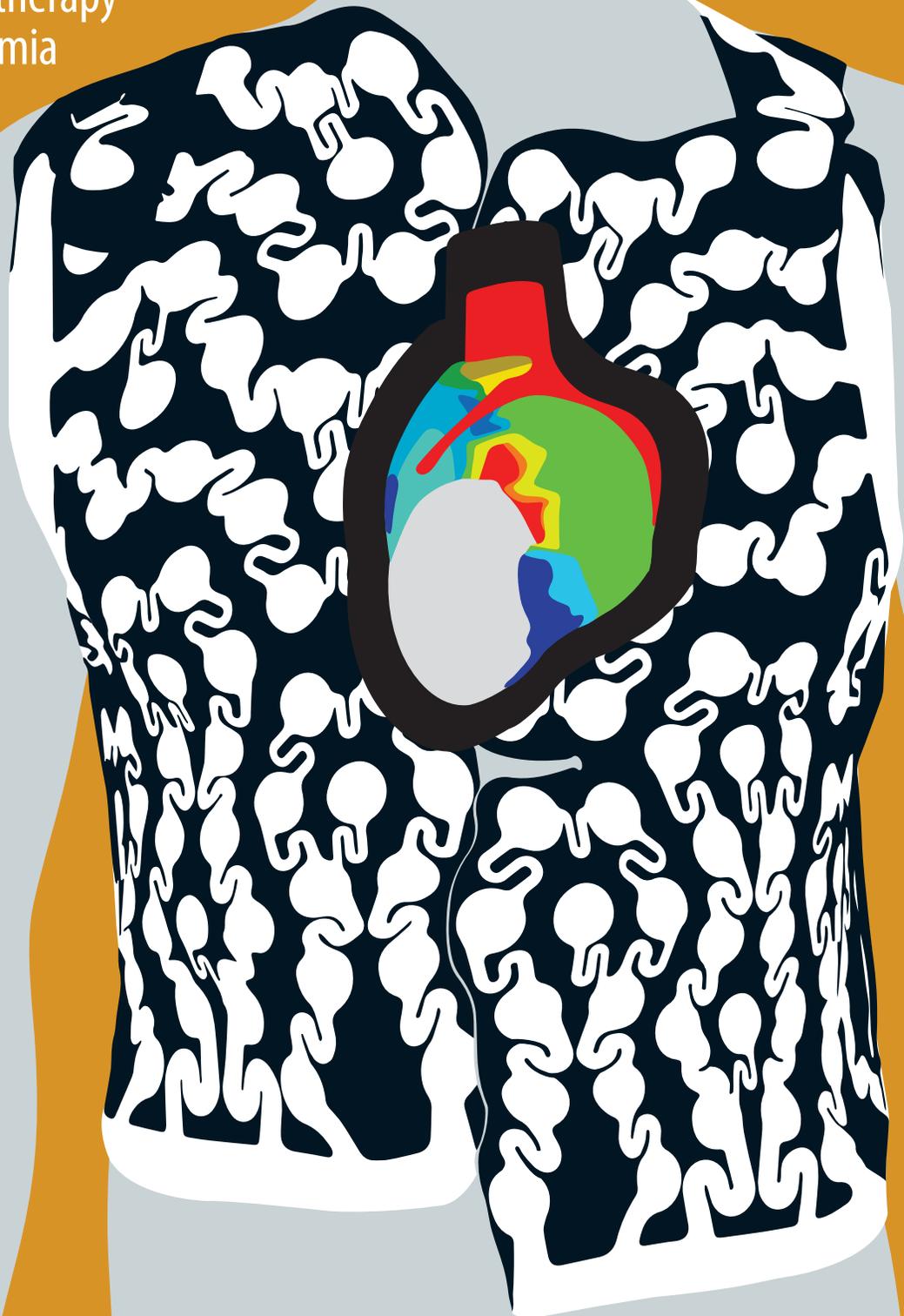


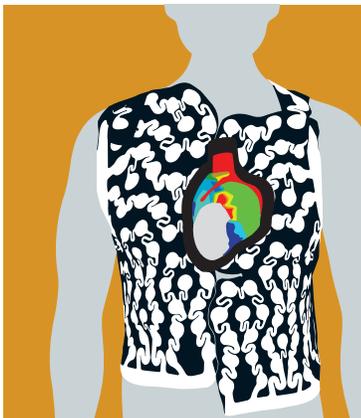
Washington
University in St. Louis

SCHOOL OF MEDICINE

Targeting a killer

Noninvasive therapy
halts arrhythmia





SARA MOSEK

COVER Early results show a new non-invasive therapy — delivered in 10 minutes or less — is halting arrhythmia when standard treatments have failed. A vest (above), covered in 252 electrodes, produces a panoramic map of a patient's heart. Doctors use this map to direct a radiation beam at the heart, zapping malfunctioning cells. See page 14.

FEATURES

- 7** **Big data**
Putting information-based tools in doctors' hands.
- 14** **Radiation beam to the heart**
Noninvasive therapy halts arrhythmia in clinical trials.
- 20** **Critical connections**
New integrated center changes care model for women and babies.
- 26** **Match Day 2018**
Graduating medical students learn where they will spend their residency.

Outlook

Washington University School of Medicine

OUTLOOK.WUSTL.EDU SUMMER 2018

In a well-choreographed move Jan. 27, staff members transported babies one at a time — about 10 infants an hour — from the newborn intensive care unit (NICU) at St. Louis Children's Hospital to the hospital's expanded NICU. Now, a 100-foot skywalk connects the NICU with labor and delivery in the new Barnes-Jewish Parkview Tower. See page 20.



MATT MILLER

As inaugural director of the Institute for Informatics, Philip R.O. Payne, PhD, is charting a new path forward for big data initiatives at Washington University. See page 7.

DEPARTMENTS

2 Pulse

28 Alumni & Development

28 Gaining mobility

30 Before Alzheimer's begins

32 Classnotes



MATT MILLER

Sylvia, 12, tries on a medallion commemorating a professorship in her grandfather's name, while family members look on. Big sister Mackenzie (background, center) is joining the freshman class this fall. The family established the Daniel J. Brennan, MD, Professorship in Neurology. See page 30.

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Body clock disruptions may be first sign

Changes could ID Alzheimer's risk sooner — years before memory loss

People with Alzheimer's disease are known to have circadian clock disturbances that affect the sleep/wake cycle. New research indicates that such disruptions also occur much earlier in people whose memories are intact but whose brain scans show preclinical evidence of Alzheimer's.

The findings could help doctors identify people at risk of Alzheimer's, a disease that can take root in the brain 15 to 20 years before clinical symptoms appear.

The research was published Jan. 29 in the journal *JAMA Neurology*.

"It wasn't that the people in the study were sleep-deprived," said first author Erik S. Musiek, MD, PhD, an assistant professor of neurology. "But their sleep tended to be fragmented. Sleeping solidly for eight hours is very different from getting eight hours of sleep in one-hour increments."

The researchers conducted a separate study in mice, published in *The Journal of Experimental Medicine*, showing that circadian disruptions accelerate the development of amyloid plaques in the brain — a process linked to Alzheimer's.

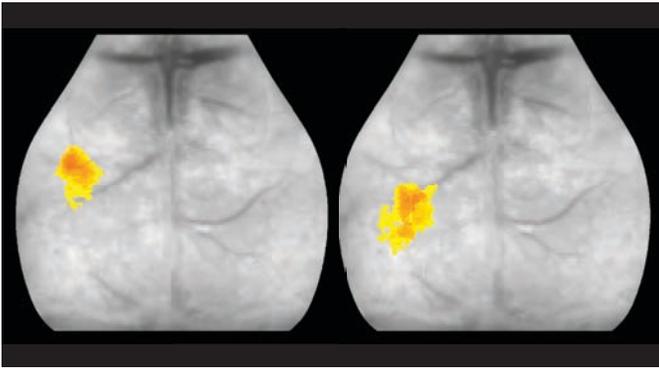
Previous studies at Washington University, conducted in people and in animals, have found that amyloid levels fluctuate predictably during the day and night — decreasing during sleep and increasing when sleep is disrupted or when people don't get enough deep sleep.

In this work, the researchers tracked circadian rhythms in 189 cognitively normal, older adults with an average age of 66. Some had positron emission tomography (PET) scans to look for Alzheimer's-related amyloid plaques in their brains. Others had their cerebrospinal fluid tested for Alzheimer's-related proteins. And some had scans and spinal fluid testing.

Of the participants, 139 had no evidence of the amyloid protein that signifies preclinical Alzheimer's. Most had normal sleep/wake cycles, although several had circadian disruptions that were linked to advanced age, sleep apnea or other causes.

But among the other 50 subjects — who either had abnormal brain scans or abnormal cerebrospinal fluid — all experienced significant disruptions in their internal body clocks, determined by how much rest they got at night and how active they were during the day.

The researchers said it's too early to determine whether disrupted circadian rhythms put people at risk for Alzheimer's disease or vice versa.



Researchers helped mice recover faster from stroke by clipping their whiskers, an important sensory organ. The above images show brain mapping at eight weeks post-stroke in mice with whiskers intact (left) and with trimmed whiskers.

Stroke recovery improved by sensory deprivation

Temporarily shutting off neuronal signals to a healthy part of the brain may aid stroke recovery, according to new research in mice.

Mice that had experienced strokes were more likely to recover the ability to use a front paw if their whiskers were clipped following a stroke. Trimming the whiskers deprives an area of the mouse’s brain from receiving sensory signals. And it leaves that area of the brain more plastic — or receptive to rewiring to take on new tasks.

“We may have to rethink how we do stroke rehabilitation,” said senior author Jin-Moo Lee, MD, PhD, the Norman J. Stupp Professor of Neurology. “Stroke rehab often focuses on trying to train patients to compensate for disability caused by the stroke, but this strategy has limited effectiveness. Our findings suggest that we may be able to stimulate recovery by temporarily vacating some brain real estate and making that region of the brain more plastic. One way to do that might be by immobilizing a healthy limb.”

The researchers triggered, in mice, a stroke in the part of the brain that controls the right forepaw. Then, they trimmed the whiskers in half of the mice. Immediately after the strokes, both groups of mice favored their left forepaws. But by four weeks after the strokes, those with clipped whiskers had begun using their right forepaws again, and by eight weeks, they were back to using both equally. In contrast, mice whose whiskers were not clipped showed no improvement at four weeks and only partial recovery at eight weeks.

Brain mapping revealed that, in each mouse with trimmed whiskers, the locus of forepaw control had taken over part of the area that usually receives whisker sensation.

“Maybe we need to start thinking about improving outcomes by enhancing plasticity in targeted regions of the brain,” Lee said.

Drug compound shows promise against arthritis

A new drug compound — that dials down inflammation and is more selective than other compounds targeting the same inflammatory pathway — might be useful against autoimmune disorders such as rheumatoid arthritis, according to School of Medicine research.

The protein p38 MAPK helps tissue remain healthy, but when chronically switched on, it attacks the body’s own tissues. Because this protein drives inflammation in many disorders, drug companies have developed compounds to block its signaling. These compounds work for a while, but eventually the body recalibrates and inflammation returns.

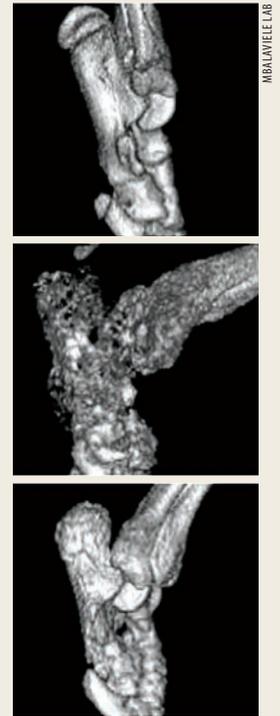
Rather than blocking the entire pathway, the new compound, CDD-450, hits just one of several branches a bit downstream of the p38 MAPK protein. Blocking that pathway while allowing the other branches to operate freely may remedy the inflammation recalibration problem.

Studying mice, rats and human cells, the researchers found that the compound reduces levels of inflammatory signaling molecules. The scientists further showed that it prevents the destruction of bones and joints in a rat model of rheumatoid arthritis.

Developed by Confluence Discovery Technologies Inc., the compound is novel because it is not a global inhibitor of the protein, said Gabriel Mbalaviele, PhD, an associate professor of medicine and company co-founder.

CDD-450 could be taken by mouth, unlike some anti-inflammatory treatments called biologics that must be injected into the bloodstream. Also, because biologics are made of short protein sequences, the immune system may recognize them as foreign and eliminate them, resulting in resistance buildup. The new inhibitor, a small molecule, bears no resemblance to proteins.

Aclaris Therapeutics Inc. recently acquired Confluence and is moving toward clinical trials to test the safety of CDD-450 (now called ATI-450).



3D CT scans of rat paws show (from top to bottom): a normal joint; the effects of rheumatoid arthritis; reduced damage after treatment with the drug compound CDD-450.



STANDING IN SOLIDARITY Students joined in the March 14 walk-out/die-in to remember the victims of the Parkland, Florida, shooting and call attention to gun violence as a public health crisis. They also advocated for a stronger role by the Centers for Disease Control in studying the issue.

No progress seen in reducing antibiotics among outpatients

Despite public health campaigns aimed at reducing unnecessary prescriptions, antibiotics continue to be prescribed at startlingly high rates in outpatient settings, according to a new study.

The researchers analyzed de-identified data from Express Scripts Holding Co. and found that 98 million outpatient antibiotic prescriptions were filled by 39 million people during a three-year period from 2013 to 2015. They found no decline in the overall antibiotic prescription rate during that time.

“This study suggests that current guidelines on prescribing antibiotics are not being followed,” said Michael Durkin, MD, assistant professor of medicine and co-director of the Antimicrobial Stewardship Program at Barnes-Jewish Hospital.

The data tracked monthly prescription rates for all antibiotics, including the five most prescribed in outpatient settings: azithromycin, amoxicillin, amoxicillin/clavulanate, ciprofloxacin and cephalexin.

The CDC estimates that up to 30 percent of antibiotic prescriptions in outpatient settings may be unnecessary, such as those written for sore throats and sinus infections, which most often are caused by viruses. Overuse contributes to the rise of drug-resistant superbugs and excess health-care costs.

The researchers are conducting further studies to understand the gap between guidelines and prescribing practices.

Seven faculty named 2017 AAAS fellows

Seven faculty members are among 396 new fellows selected by the American Association for the Advancement of Science (AAAS), the world’s largest general scientific society.



Michael G. Caparon Jr., PhD

Professor of molecular microbiology

Honored for his studies of disease-causing bacteria, such as those that cause strep throat, scarlet fever and urinary tract infections.



Graham A. Colditz, MD, DrPH

Niess-Gain Professor of Surgery and chief of the Division of Public Health Sciences

Honored for contributions to cancer epidemiology and prevention.



John A. Cooper, MD, PhD

Professor and head of the Department of Biochemistry and Molecular Biophysics

Honored for contributions to the field of cell motility and the cytoskeleton, particularly for actin assembly and function.



Michael S. Diamond, MD, PhD

Herbert S. Gasser Professor of Medicine

Honored for his studies of how viruses such as West Nile, Zika, dengue and chikungunya evade the immune system and cause disease.



Susan K. Dutcher, PhD

Professor of genetics and the interim director of the McDonnell Genome Institute

Honored for contributions to the field of cell biology, particularly for studies examining the assembly and function of cilia.



Timothy J. Eberlein, MD

Bixby Professor of Surgery and head of the Department of Surgery; director of Siteman Cancer Center

Honored as a pioneering, national leader in surgery education, research and publishing, and in development of cancer center networks, research programs and clinical protocols.



Michael L. Gross, PhD

Professor of chemistry in Arts & Sciences and of immunology and pathology and of medicine in the School of Medicine

Recognized for contributions to physical-organic, analytical, environmental and biophysical chemistry by developing and applying mass-spectrometry methods.



MATT MILLER

Wonderfully weird

Students got creepy and kooky, mysterious and spooky and altogether ooky in their performance of “The Addams Family Musical” in March. The production, a culmination of a yearlong planning process, involved students from all educational programs on the Medical Campus. This was the 13th year for the show, which is entirely student-produced. Students build sets, sew costumes, run light and sound, play in the pit orchestra, direct and act. Left: Uncle Fester, as played by Matt Mosley, a student in the Division of Biology & Biomedical Sciences.

New way to fight sepsis: Rev up immune systems

Clinical trial demonstrates significant, lasting increase in key immune cells

Sepsis — a condition that develops when an infection triggers an overwhelming immune response — causes about 250,000 deaths annually in the U.S. Standard treatment, involving high doses of antibiotics, often doesn’t work well and fails to boost the body’s immune defenses.

Now, a drug that revs up the immune system is showing promise in a small clinical trial. The approach goes against the grain of earlier strategies that have relied on antibiotics and inflammatory medications to tamp down the immune system.

“Mortality rates from sepsis have remained essentially the same over the last 50 years,” said senior investigator Richard S. Hotchkiss, MD, a professor of anesthesiology, of medicine and of surgery. “Hundreds of drugs have been tried and have failed. It may sound counterintuitive when inflammation is such a problem early in sepsis, but our approach is to stimulate certain immune cells to help the patient’s system take control of the infection.”

The trial involved 27 sepsis patients, ages 33 to 82, who were treated at Barnes-Jewish Hospital, Vanderbilt University Medical Center in Nashville or two medical centers in France — Dupuytren University Hospital in Limoges and Edouard Herriot Hospital in Lyon.

The patients were treated with a drug made of interleukin-7 (IL-7), which enhances the proliferation and survival of immune cells CD4 and CD8. These cells are important because they recruit other immune cells to fight severe infections that can lead to organ failure and death. Patients who develop the most serious form of sepsis, called septic shock, often have very low counts of these key immune cells.

The trial patients, all hospitalized and severely ill with septic shock, were randomly assigned to one of two therapies. Seventeen patients received the IL-7 drug, and 10 received a standard treatment. Those who received the IL-7 drug experienced a threefold to fourfold increase in CD4 and CD8 counts.

Traditional approaches do not address the critical problem of patients’ severely



HUY MACH

A small clinical trial led by Richard S. Hotchkiss, MD, shows that a drug that revs up the immune system holds promise in treating sepsis. From left, Hotchkiss, an ICU doctor for the past 30 years, his clinical trial patient, Greg Porter, who recovered from sepsis, and nurse manager Jane Blood, RN.

compromised immune systems. Without restoring immune function, Hotchkiss said, many patients develop lingering infections and are helpless to fight any new infections.

A larger trial is being planned to determine whether IL-7 can improve survival rates.



EARNING A SPOT STAT, an online biomedical science news publication, chose 64 teams to compete in STAT Madness 2018, a March-Madness-esque battle designed to find the most innovative scientific and medical research of 2017. Two School of Medicine teams made the bracket, and one of them made it to the “Elite Eight.” That team, led by Farshid Guilak, PhD (foreground), was chosen for research aimed at rewiring stem cells to cure arthritis.

American Academy of Arts and Sciences elects Perlmutter



David H. Perlmutter, MD, dean of the School of Medicine, will join the likes of former President Barack Obama, actor Tom Hanks and Supreme Court Justice Sonia M. Sotomayor as new members of the American Academy of Arts and Sciences.

Perlmutter, the Spencer T. and Ann W. Olin Distinguished Professor and executive vice chancellor for medical affairs, is internationally recognized for his research on alpha-1 antitrypsin deficiency (ATD), a genetic disorder in which the accumulation of a misfolded protein in liver cells can result in severe liver failure.

To evaluate potential treatments for ATD, he and colleagues developed a pipeline of drugs that includes one in a phase II/III clinical trial. The goal is to eliminate the need for liver transplantation, the only treatment option for patients with progressive liver disease due to ATD.

Perlmutter was trained at Children’s Hospital of Philadelphia and Boston Children’s Hospital and has been on the faculties of Harvard Medical School and the University of Pittsburgh.

The new class will be inducted in October in Cambridge, Massachusetts, joining a list that includes Benjamin Franklin, Alexander Hamilton, Ralph Waldo Emerson, Charles Darwin, Albert Einstein and Martin Luther King Jr.

CRISPR enhances cancer immunotherapy

Last year, the Food and Drug Administration approved the first cellular immunotherapies to treat cancer. These therapies involve collecting a patient’s own immune cells — called T cells — and supercharging them to home in on and attack specific blood cancers, such as hard-to-treat acute lymphoblastic leukemia and non-Hodgkin lymphoma.

But so far, these T cell immunotherapies — called CAR-T cells — can’t be used if the T cells themselves are cancerous. Even though supercharged T cells can kill cancerous T cells, they also can kill each other because they resemble one another so closely.

School of Medicine scientists now have used the gene-editing technology CRISPR to engineer human T cells that can attack human T cell cancers without succumbing to friendly fire.

The study in mice appears online in the journal *Leukemia*.

Cancerous and healthy T cells have the same protein — CD7 — on their surfaces. The team, led by senior author John F. DiPersio, MD, PhD, the Virginia E. and Sam J. Golman Professor of Medicine in Oncology, first generated a novel CAR-T strategy targeting CD7, allowing for the targeting and killing of all cells with CD7 on the surface.

“But if we program T cells to target CD7, they would attack the cancerous cells and each other, thus undermining this approach,” DiPersio said. “To prevent this T cell fratricide, we used CRISPR/Cas9 gene editing to remove CD7 from healthy T cells, so they no longer carry the target.”

DiPersio and his colleagues also used CRISPR to simultaneously eliminate the therapeutic T cells’ ability to see healthy tissues as foreign.

This way, T cells from any normal donor can be used without risk of life-threatening toxicities such as graft-versus-host disease. A “matched” donor with similar immunity is not required.

This new approach also may have broad implications for the CAR-T field, allowing for use of therapeutic T cells from any healthy donor.

The researchers demonstrated that this approach is effective in mice with T cell acute lymphoblastic leukemia taken from patients. They are working toward clinical trials of the gene-edited CAR-T cells.



John DiPersio, MD, PhD, right, works in the lab with study co-author Armin Ghobadi, MD.

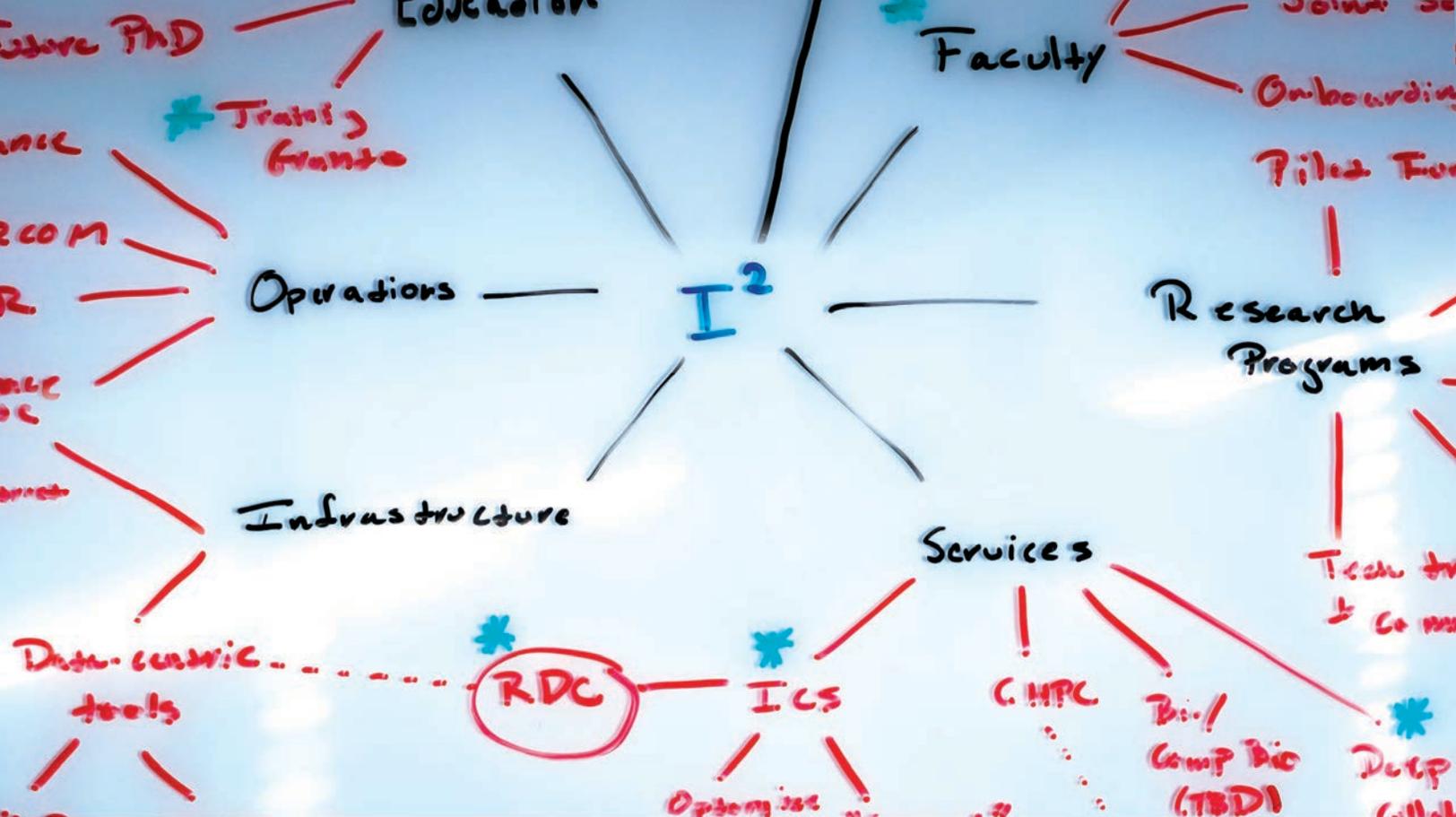


BIG DATA

Putting information-based tools in doctors' hands

BY DEB PARKER

BIG DATA



The Institute for Informatics — also known as I² — sits at the center of all big data initiatives at Washington University. It provides an academic and professional home for informatics science, education and practice.

Genomic medicine. Personalized medicine. Precision medicine.

When it comes to interpreting and applying big data in health care, people may not agree on the best terminology. Most agree on one thing: Big data is an abstract, intimidating concept.

DNA sequencing generates millions of data points for a single individual. Clinical trials yield massive amounts of treatment information. The electronic health record (EHR) expands with every patient encounter. And wearable fitness trackers and apps — which measure steps taken, food consumed, heart rate, blood pressure and sleep patterns, open up a whole new area of possibility.

Big data is coming at medical professionals from all directions. Many have no idea how to effectively leverage it for patient care.

Philip R.O. Payne, PhD, is an internationally recognized leader in informatics, a field that translates big data into actionable knowledge. As inaugural director of the university's Institute for Informatics, he leads the way he speaks — at double speed. In 20 months of existence, the institute has made significant inroads at this large, decentralized university.

For Payne, the path forward is clear.

“If you ask physicians what they want, it’s the equivalent of a ‘patients like mine’ button on their electronic device,” he said.

“They tell us, ‘Given the patient that’s in front of me right now, show me similar patients who have been seen in the past six months, one year or 10 years. What treatment decisions were made? Who had the best outcomes? Who didn’t?’

“Physicians want to know, based on their wisdom and the wisdom of colleagues, how to optimize outcomes for the patient in front of them.”

Information overload

Provider burnout nationally is at an all-time high, with doctors citing such factors as job complexity and having too few hours in the day. By some estimates, EHR upkeep requires 31 percent of physicians’ time.

A few decades ago, doctors could stay abreast of medical advances by reading scholarly journals. Now, it’s virtually impossible to keep up with the constant flow of information.

“Human short-term memory is optimized to remember seven pieces of information at a time, plus or minus two,” said Payne, also the Robert J. Terry Endowed Professor. “Informatics is essential to figuring out how we connect the dots between those millions of data points, contextualize them and deliver them back to clinicians who may have only 10 minutes with a patient to interpret and act on that information.”

Payne envisions a new landscape — where doctors and researchers have the necessary tools and expertise to extract meaningful information within vast data sets.

When many people hear the word informatics, Payne said, they associate it with interpreting the human genome, but that’s just one aspect of the institute’s work.

A top priority is improving EHR efficiency. The EHR requires a mental shift for some physicians who are used to free-form documentation of patient encounters on paper versus a more rigid, checkbox system that perhaps even influences medical thinking. Many clinicians find it clunky, burdensome and disruptive. Institute team members are shadowing clinicians at the point of care to design technologies that adapt to workflow.

Efficiently designed systems can close the gap between digesting the data and making clinical decisions, Payne said. “The real challenge is not getting more data. It’s figuring out what to do with what we already have.”

Recently, Payne and David H. Gutmann, MD, PhD, the Donald O. Schnuck Professor and director of the Neurofibromatosis (NF) Center at Washington University, employed informatics to predict symptom severity in children with NF1, a genetic disorder that causes brain and nerve tumors, as well as autism spectrum disorder (ASD). NF1 varies widely in severity and symptoms — from harmless brown spots on the skin and benign bumps to optic gliomas and malignant cancers. Parents don’t know which symptoms might manifest in their child.



The institute is actively training the next generation of informatics specialists. Here, Andrew Michelson, MD, left, a pulmonary and critical care fellow, and Sean Yu, a biomedical informatics doctoral student in the Payne-Lai lab, discuss analytical methods to predict septic shock.

In a matter of hours, using computer analytics and existing NF1 patient data, Gutmann and Payne improved risk models that others had created following months of painstaking deliberation in conference rooms. With even greater specificity, they outlined various NF1 subtypes, their trajectories and associations with optic gliomas and ASD.

This information allows families to plan ahead, and alerts clinicians as to whether additional imaging or other interventions are warranted.

“Precision medicine isn’t always about curing,” Payne said. “We can improve quality of life by illuminating the unknown. It’s also helpful for the clinician in the exam room, who is facing imaging reports, EHR data, gene sequencing results, maybe a social/behavioral evaluation report — and an anxious child and an anxious parent. We are relying on physicians to integrate on demand and make the best possible decision. That’s a source of stress for providers, who have limited time and an EHR that isn’t designed very well.

“But if we can integrate that data and say to those providers, ‘This patient has an 80 percent probability of developing an optic glioma and here are the outcomes for the last 10 children you saw similar to this,’ then we’ve allowed them to get down to the really important information and have a conversation with the family and not just sit there clicking and pointing and typing.

“That’s the real promise if we do all the things we’re talking about.”

A data-driven approach, Payne said, is going to be a key differentiator as institutions compete to provide exceptional care in an information-rich era. Within its storehouses, big data holds the answers to pressing medical questions of our time; it has the power to develop drugs faster at lower cost, speed diagnosis, deliver on the promise of personalized, or precision, medicine, and improve quality of life.

A home advantage

Harnessing this power requires an environment that’s built to rapidly translate discovery out of the lab and into the clinic.

Washington University, in partnership with BJC HealthCare, stands uniquely poised to lead on the informatics frontier, with key strengths in medicine, basic science, cancer, genomics, radiology, public health, social work, business and engineering, among others. Nearby sits the 200-acre Cortex Innovation Community, a thriving hub for bioscience research, development and commercialization.

“We have one of the best genome institutes and one of the most productive and most impactful basic science research enterprises in the world,” Payne said. “We have some of the smartest care providers that you will meet. We have a unique living laboratory between Washington University Physicians and



BJC HealthCare, where we have a large academic referral center, plus regional hospitals and primary care practice sites in urban and rural environments.

“We have all the pieces we need to study what the future of health care looks like. Very few U.S. academic health centers are truly primed to take advantage of the health-care information age.”

Until the institute’s launch, the university had all the raw pieces, except one. Although pockets of informatics strength existed — including leadership in the Human Genome Project, the Connectome Project and efforts to understand the microbiome — there was no central academic and professional home for informatics science and practice.

Every School of Medicine department chair contributed funding from department reserves to establish the Institute for Informatics, also known as I².

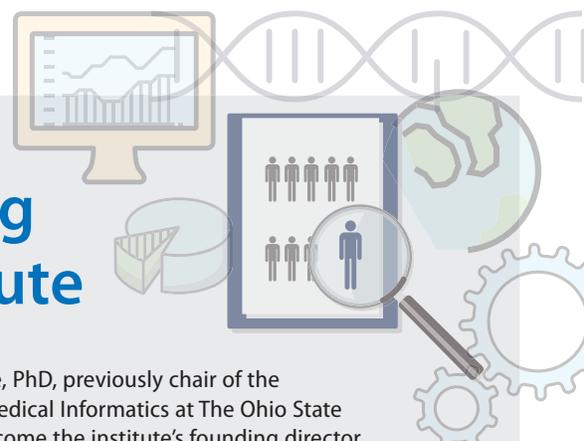
One patient, one record

After putting critical team members in place, institute leaders turned their attention to their first, most fundamental task: Getting everyone within this expansive, 15-hospital system and medical school on the same page.

This June, with the institute’s active participation, the medical school and BJC HealthCare will roll out the Epic electronic health record system on the academic campus. It already has been launched in many of BJC HealthCare’s community hospitals. Once fully implemented, Epic will replace more than 50 standalone EHR systems that had been used by individual physician groups, specialty clinics, hospitals and even departments within the hospitals. Previously, outpatient data generated through Washington University Physicians (faculty practice plan) was not connected to hospital inpatient data. And some records were still paper-based.

As Sam Bhayani, MD, chief medical officer of Washington University Physicians, explains, the medical center draws patients who live hours away and who have complex problems and see multiple specialists.

Bringing data into one centralized location eliminates the need for patients to recall their entire medical history, such as the date of their last tetanus shot or prescription dosages, and will reduce treatment redundancies, potentially saving money, and help eliminate harmful drug interactions. It also allows clinicians to view patients holistically and



Launching the institute

When Philip R.O. Payne, PhD, previously chair of the Department of Biomedical Informatics at The Ohio State University, signed on to become the institute’s founding director, he brought longtime colleagues with him.

This allowed for rapid deployment in targeted areas:

- Speeding pace of discovery out of the lab into human studies
- Building systems that improve how physicians treat patients
- Using data to improve health of communities

Most faculty affiliated with the institute, which is housed in the Division of General Medical Sciences, will hold dual appointments in other departments and schools. This is part of a strategy to extend the institute’s reach across the university. An informatics expert embedded in anesthesiology or pediatrics, for example, will collaborate on projects related to these subjects.

Key informatics faculty investigators



Clinical research informatics

Chief Research Information Officer Albert M. Lai, PhD, an expert in informatics infrastructure who specializes in solving problems in the clinical domain. He oversees a core services team of programmer analysts, software engineers, database administrators, data analysts and bioinformaticists.



Population health informatics

Randi Foraker, PhD, MA, FAHA, who applies informatics techniques to solve problems in the population health domain. She also serves in the Institute for Public Health.

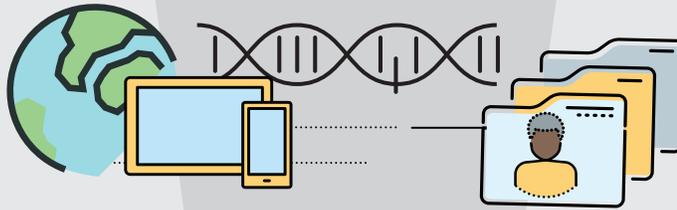


Applied clinical informatics

Po-Yin Yen, PhD, RN, an assistant professor at the Goldfarb School of Nursing at Barnes-Jewish College, who works with frontline caregivers to understand daily workflow and improve health information technology.

When data becomes treatment

SOURCES



Sources

Data is generated through the EHR, clinical studies, genome sequencing and patient-reported outcomes, among other sources.

Methods

Data is integrated in the Research Data Core, a centralized warehouse managed by statistical data analysts. Here, various approaches can be used to analyze data — from machine learning to visualization.

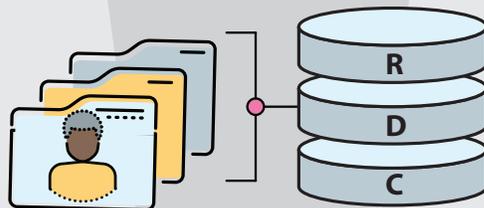
Output

From this analysis, decision-support tools can be designed to assist physicians at the point of care. These tools — such as reminders for preventive care or alerts about potentially dangerous situations — can be deployed through laptops, tablets and mobile phones.

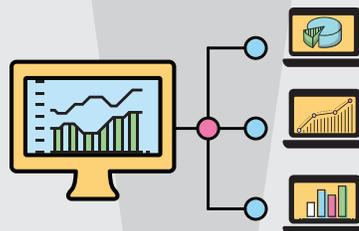
Impact

Precise, knowledge-based interventions benefit doctors, researchers, patients, communities and policymakers.

METHODS



OUTPUT



IMPACT



consider all factors across the continuum of care. What should emerge is a more comprehensive picture of a person's health care, including total cost of care.

This, however, is only half of the vision. Patient information must be returned back to investigators as they consider new ways to solve complex health-care problems. Data mining within a decentralized system has been an arduous, inefficient task.

“For some patients, we had very little data. All we knew is what happened during their hospital stay,” said Chief Research Information Officer Albert M. Lai, PhD. “If you're a researcher trying to understand optimal care delivery, it's basically impossible given this fragmented view.”

A new research paradigm

A centralized EHR has revolutionary research implications for Washington University — joining together and unlocking access to more than 6 million records of inpatient and outpatient care.

“We want to translate data into knowledge,” Payne said. “We want to create a system where what we learn from each patient informs how we treat other patients and what questions we ask in the lab. In turn, we want what we learn in the lab to benefit patients more quickly.

“Right now, we have clinical investigators seeing patients. But they go back to their labs and they don't have access to the data generated by their own patients, at least not to the degree necessary to test basic hypotheses. We need to make that data more accessible.”

The real forward leaps in innovation will come as the institute builds out a large, integrated database — known as the Research Data Core (RDC) — that links all data. The RDC powerhouse will include the common EHR, which feeds a continuously updated stream of patient data, plus data from any remaining legacy or departmental clinical systems. Plans call for the addition of genomic and biospecimen information.

Statistical data analysts within the institute will manage the RDC. These informatics professionals will help researchers pull data from the central system, design studies and maintain patient confidentiality. They and other team members are available to educate, answer questions and analyze and visualize data in meaningful ways.

Through self-service tools, researchers will be able to access the RDC and do some analysis at their own computers.

Informatics leaders say a new partnership with a company called MDClone also has the potential to fast-track research. Washington University is the first U.S. academic institution to have this technology.

Under current federal regulations, investigators must wait weeks or months to begin research projects involving real patients. For each project, researchers must file paperwork and wait for approval from an institutional review board (IRB), an administrative body that protects the rights and welfare of human research subjects. Following approval, researchers then must wait for a data analyst to pull the necessary data before research can get underway.

MDClone's unique niche is its ability to create synthetic data — data that looks like an actual patient population, but isn't. Data engines yield synthetic data that is statistically identical to original protected health information, but without privacy concerns.

"With MDClone, you could effectively have no time delay," Lai said. "If you think of an idea, you can pull up the data and analyze it, right then and there, from the computer in your office, potentially make discoveries on the data, with zero risk to patient privacy."

If the data looks promising, researchers can follow the standard IRB steps to confirm the result with real data. If not, Lai said, they can just move on to the next question.

The institute is testing MDClone's performance via pilot research projects. Pending a successful evaluation, MDClone will become part of the RDC infrastructure.

Creating efficiencies in research saves time and allows grant dollars to stretch farther, Payne said, which, in turn, will attract top U.S. researchers.

Speeding discovery

Payne hopes to speed up the process of taking discoveries into clinical trials. Currently, it can take 15 to 20 years and more than \$1 billion to develop therapeutic agents for disease.

Treatment solutions, however, are waiting to be found in big data. Repurposing or using new combinations of approved drugs, which already have passed toxicity tests, could save valuable time.

Using an informatics concept known as "machine learning," computers can be programmed to comb through clinical and drug data, going back through decades of medical literature, analyzing billions of variables, to discover meaningful patterns and new uses for existing medicines.

Payne, also a cancer researcher, points to malignant melanoma as one example. Frontline therapies are effective at causing tumors to disappear, but patients often become resistant within 12 months of the first treatment. By using public data and computational methods, researchers have found drugs — developed for other diseases — that could be combined with melanoma frontline therapies to prevent or delay resistance onset. So far, Payne's research team has taken this combination therapy all the way to animal models, and they did it in about a year.

Once a therapeutic agent is ready to move to clinical trials, the RDC also should make it quicker and more efficient to identify test subjects.

Enhancing human health

The dream, Payne said, is to use big data not only to help the sick, but also to keep people well, to intervene in the communities where they live, work and play, and not just inside our hospitals.

An evolving EHR likely will include more data about patients' daily activity levels, gathered through smartphones and fitness trackers, and other health influencers, such as water quality in the home, proximity to grocery stores and family support networks.

Big data has the power to promote wellness by generating a picture of the whole patient — connecting genes and environmental factors to social factors and outcomes.

"The institutions that figure out how to bring all these pieces together will be the first to begin delivering personalized, precision medicine," Payne said. "Rather than treating people as a function of averages, personalized health care that is powered by big data is about enabling physicians to provide the right care at the right time, based on the unique characteristics of the patient in front of them." □

Radiation beam *to the heart*



Doctors halt deadly rhythm with noninvasive therapy

BY REBECCA BOYLE

In the early days of his irregular heartbeat, Clarence Mankin would pass out before his implanted defibrillator kicked in to reboot his heart. He would wake up a bit later, dazed but alive. After his doctor adjusted the device's sensitivity, it would shock his heart before he fainted, which, in some ways, was worse. Mankin could feel it coming — the lightheadedness, the dizziness — and he'd know to brace himself for the jolt.

"It's like a good thump in the chest. It feels like you are going to die," he said. "I'd try to grab hold of something, or find something to sit down on, which occasionally I was able to do."

Mankin, 74, a retired Lutheran pastor in Atlanta, Illinois, used to pride himself on walking 10,000 steps a day, which he tracked with his wrist pedometer. But when he started feeling the jolt all the time — at one point, he was having 11 episodes a day — he stopped walking.

He stopped driving.

He stopped leaving the couch.

About 3 million Americans experience arrhythmia, in which the heart beats too fast, too slow, or too irregularly. One such form, ventricular tachycardia, is the leading cause of sudden cardiac arrest.

An unlikely pairing between a School of Medicine cardiologist and a radiation oncologist, however, has led to a revolutionary treatment: Mankin is one of the earliest patients to sustain a beam of radiation directly to his heart.

Ventricular tachycardia (VT) results from other cardiac problems. Mankin, who served in the U.S. Army during the Vietnam War, had his first heart attack at 44, which he attributed to Agent Orange exposure.

Injury to the heart, commonly from a heart attack, causes some cells to die, forming scar tissue. When heart cells are damaged in this way, they might not function correctly, causing the heart to short-circuit. This makes it beat out of sync, which means the heart might not be able to pump enough blood throughout the body, and it can even stop entirely.

Standard treatments include medications, defibrillators and a procedure known as catheter ablation. Patients must be sedated for this invasive procedure as doctors thread fine tubes through the femoral vein, up into the heart. A tiny electrode tip, no larger than a headphone jack, selectively burns away heart cells that have gone haywire.

The procedure can last from four to 10 hours, and recovery can take several weeks. Although physicians have developed precise ablation techniques to ensure they destroy as many wayward cells as they can, the treatment doesn't always work. It also has a cluster of side effects, from infections to bleeding problems. In a 2016 study, half of patients who underwent catheter ablation saw their tachycardias return.

The same was true for Mankin.

Then Mankin's cardiologist referred him to Phillip S. Cuculich, MD, a heart rhythm specialist and an associate professor of medicine at Washington University.

Cuculich and Cliff G. Robinson, MD, an associate professor of radiation oncology, recently had teamed up to provide a new type of arrhythmia treatment, one that cardiologists nationally are calling a game changer for patients with few remaining options.

Mankin agreed to give it a try.

To undergo the procedure, he donned a specially designed vest covered in 252 electrodes (as compared to 12 for a typical electrocardiogram).

Then Cuculich briefly induced VT in Mankin using his defibrillator. This allowed him to produce a panoramic map of Mankin's heart. Later, Mankin lay inside a cylindrical chamber. A custom mold held him in place to prevent him from moving or breathing too deeply. Robinson used the map to direct an intense, focused beam of radiation at his heart.

The high-energy particle stream is typically used to blast away cancer cells, and, during normal use, Robinson does everything he can to avoid hitting the heart. But this time, his particle beam intentionally zapped malfunctioning cells that were causing Mankin's heart to beat out of sync.

On average, the procedure takes less than 15 minutes.

"I've spent my entire life as a trainee and an attending physician thinking about ways to avoid dosing healthy tissues," Robinson said. "But this is already an injured region. If you think about it as a diseased part, where Phil would have no problem going in with a catheter to burn that area, well, we are doing the same thing. There are other ways to get energy inside the body."

To treat arrhythmia, cardiologist Phillip S. Cuculich, MD, performs catheter ablation. For this procedure, the patient must be sedated as Cuculich threads fine catheters through the femoral vein, up into the heart, to burn away malfunctioning cells.



MATT MILLER

Catheter Ablation

4–10
hour procedure

2 days
in the hospital

40–70%
success rate

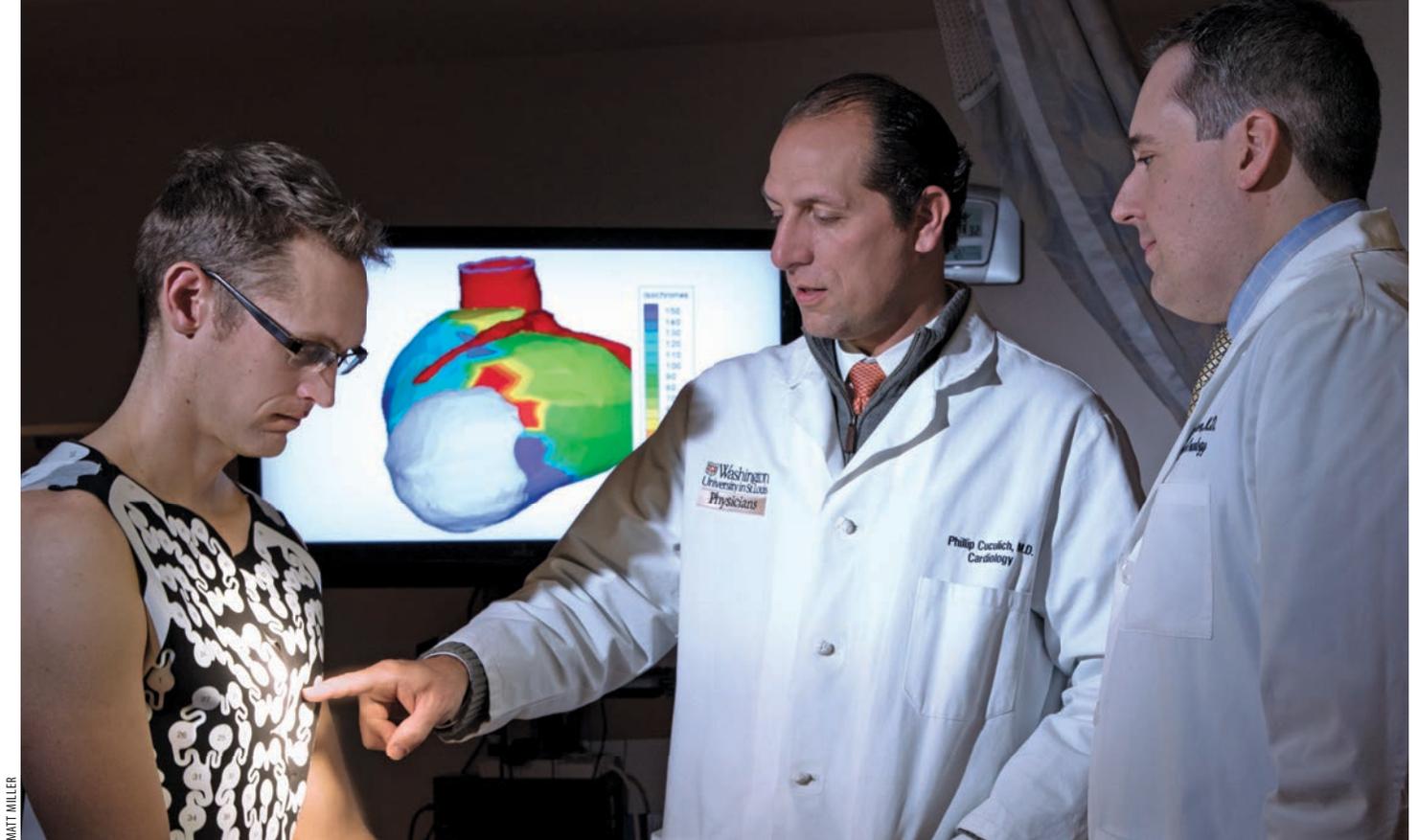
2–12%
complications

Noninvasive Radiotherapy

< 10
minute procedure

25 minutes
door-to-door

TBD
Success rates and
complication rates
are being evaluated
in clinical trials.



MATT MILLER

Mankin was awake throughout the radiation therapy, which took place Sept. 8 at Barnes-Jewish Hospital. When it was over, he sat up, swung his legs off the table, and walked out of the room. He felt no pain.

On a warm January day, Mankin visited Cuculich's office for a follow-up appointment. Cuculich downloaded data from his implantable defibrillator, which tracks each time it gives Mankin a jolt. After the appointment, Cuculich printed out the device's history on a piece of paper, and strode into Robinson's office in the radiation oncology department.

"Look at this," Cuculich said, grinning as he thrust the small square paper into Robinson's hand. Robinson's eyes widened: "Wow!" And then the oncologist, still seated in his chair, started dancing.

The sheet of paper was marked with what looked like a bar graph. The bottom axis was time, and the vertical axis depicted every instance the device was activated.

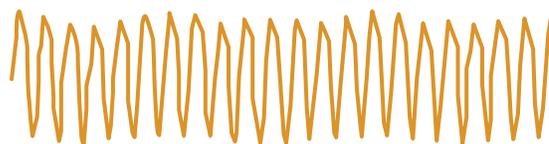
Cuculich pointed out the three months prior to the Sept. 8 radiation treatment. It looked like a forest: A spike each day, some very tall and some shorter, referencing the number of jolts each day from the device. Then Cuculich pointed to Sept. 8, and the months after Mankin's procedure. The forest had been cleared. The device had not activated at all. The tachycardia was gone.

Cuculich and Robinson both laughed. "That is amazing," Robinson said.

REGULAR HEARTBEAT



VENTRICULAR TACHYCARDIA



More than three months later, Mankin hasn't had a single jolt from his defibrillator. By February, he was walking 5,000 steps a day. "It's hard to describe. Now when I walk, I don't feel like something terrible is going to happen to me," Mankin said. "I don't know if this will extend my life or not, but it has made the quality of my life much better."

When no other options exist

Mankin is one of about two dozen patients enrolled in a clinical trial led by Cuculich and Robinson. The ENCORE-VT trial follows an initial case study from April to November 2015 with just five patients, which the physicians conducted to prove their technique would work. The results were published in *The New England Journal of Medicine* in January.

A vest covered in 252 electrodes allows Phillip S. Cuculich, MD, center, to produce a panoramic map of a patient's heart. Cliff G. Robinson, MD, right, uses this map to direct a focused beam of radiation at the heart to treat arrhythmia. Biomedical engineer Yoram Rudy, PhD, invented the vest.



MATT MILLER

Cliff G. Robinson, MD, and Kim Maserang, RT (T), prepare to treat a patient with stereotactic radiation, a very precise, high-energy dose of radiation.

Like Mankin, all patients so far have had ventricular tachycardia that has not responded to standard treatments.

In the first clinical trial, the five patients collectively experienced 6,577 episodes of VT in the three months before their radiation treatment. In the nine months afterward, they experienced four.

“It has the potential to benefit a substantial number of people,” said William G. Stevenson, MD, professor of medicine at Vanderbilt University Medical School, who was not involved in the research.

Cuculich spent several years refining techniques to map the heart in four dimensions — the three physical dimensions, plus time — to nail down the precise regions that are malfunctioning. The technique, known as electrocardiographic imaging, was developed by Yoram Rudy, PhD, the Fred Saigh Distinguished Professor of Engineering, director of the Washington University Cardiac Bioelectricity and Arrhythmia Center, and Cuculich’s mentor. But a more detailed picture of heart dysfunction was not enough, Cuculich said.

“We have created an entirely non-invasive process to map and treat arrhythmia, and we can do it in less than 10 minutes.” — Cliff G. Robinson, MD

“Even if you could non-invasively image the heart, we still required entry into the body with a catheter to fix it,” Cuculich said. “It became clear that the place to make an impact was to non-invasively treat it.”

As part of the School of Medicine’s focus on translational research, Cuculich met with neurosurgeon Albert H. Kim, MD, PhD, to discuss using ultrasound technology. Kim recommended Cuculich meet with Robinson. For his part, Robinson was looking for new ways to use stereotactic radiation — a very precise, high-energy dose of radiation — beyond cancer treatment.

“When we first met to discuss this, I was really concerned about how to hit a 5 mm area in a moving, beating heart,” Robinson said. “But Phil’s first question was, ‘How big of an area can you treat?’ And I said, ‘This is going to be a good friendship.’ Because as radiation oncologists, we don’t treat parts of tumors. We treat the whole kit and caboodle.”

Cuculich and Robinson started meeting regularly to discuss each other’s specialties and learn about their patients. Each had to relearn terminology and techniques he hadn’t studied since medical school.

“That was one of the keys to this initial success, that we came together and talked about it,” Robinson said. “That this could happen is one of the unique things about being at Washington University.”

The physicians developed a technique that relies on multiple imaging methods. MRI, CT

and PET scans combine with the electrode vest to produce a detailed map of the heart and pinpoint where arrhythmias are coming from. The imaging process involving patients takes several hours, occasionally spread over multiple days.

“Then Cliff and I sit down together and collaborate over this information, and we come to a conclusion about where the scar is, so we are as precise as possible. We want to avoid any structures that are important to the heart, and keep the potentially damaging energy within the scar,” Cuculich said.

To Robinson, that push and pull — how deep to go, how much tissue to take and how much to leave alone — is much like cancer treatment. Some patients, like Mankin, have large areas that must be treated. The burning tip used in catheter ablation is only about 3.5 millimeters across, roughly the size of a Sharpie tip. In some people, the cells that cause the heart to beat out of sync are not reachable with the tiny catheter tip. This is especially true for cells deep within the heart muscle. The radiation beam can penetrate deeper, targeting all the faulty cells.

Robinson said he was concerned some patients would be fearful of the word “radiation,” but both physicians said their patients have been less resistant than they expected, in some cases because they were desperate for any solution. Mankin said the doctors helped him understand how it would work, and why it could be so effective. “It’s novel, but if you think about it, they’ve been using the gamma knife on cancer surgeries for years now,” he said.

With such a high dose of radiation, even at a very small site, there is a risk of toxicity and ill effects on the surrounding organs and tissues. So far, patients in the initial study and in the ongoing clinical trial have done well, Robinson said. In the initial study, patients reported no complications or pulmonary symptoms during treatment or immediately after. Some people did experience mild inflammation in the lung adjacent to the target, but that resolved within a year, according to the study. Still, the potential long-term effects of the radiation dose are unknown.

“If this is to be used in younger, less-ill patients, the issue of collateral damage will become more relevant,” said Roy John, PhD, professor of medicine at Vanderbilt University Medical Center. He and Stevenson coauthored an editorial explaining the procedure’s potential in *The New England Journal of Medicine*.

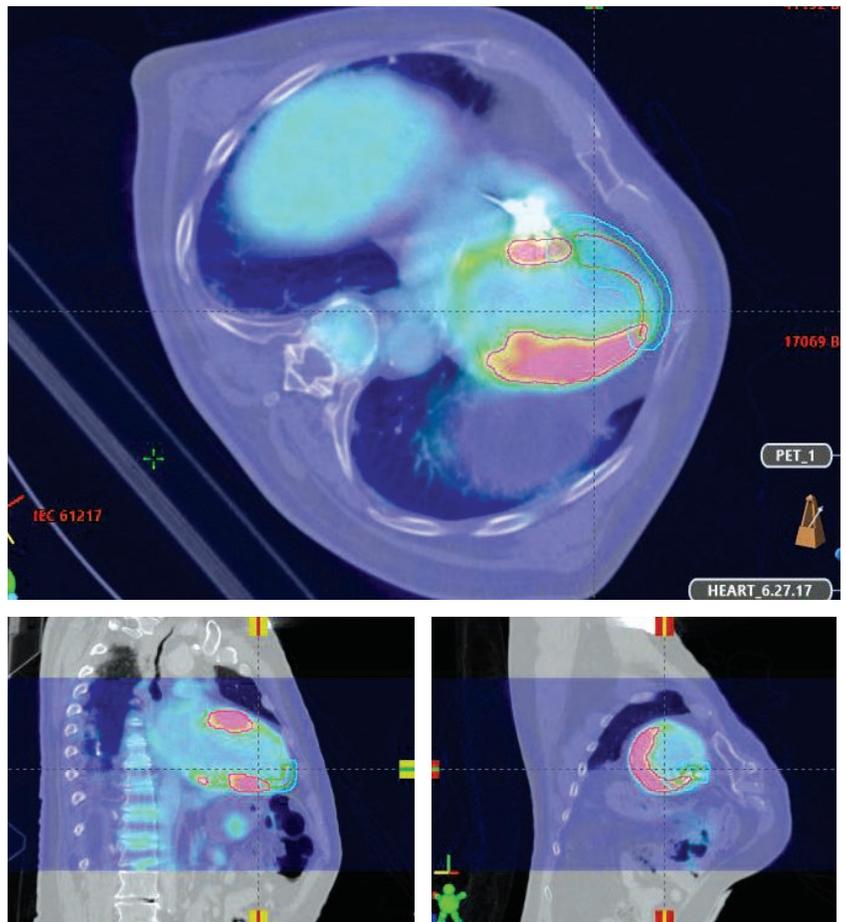
Radiation therapy likely will complement, rather than replace, ablation and other procedures cardiologists have used for many years. It provides another option for VT patients who have exhausted standard therapy options, including catheter ablation, and are facing one-year survival rates below 20 percent.

“When you get complex forms of heart disease that are responsible for a lot of complex circuitry, then there might be an advantage to an approach that is more extensive, rather than precise,” said Francis Marchlinski, MD, director of cardiac electrophysiology at the University of Pennsylvania, who was not involved in the study.

Robinson and Cuculich are finalizing their results from the ENCORE-VT trial, which included 18 patients along with Mankin. Early results, they say, are promising.

“We have created an entirely non-invasive process to map and treat arrhythmia, and we can do it in less than 10 minutes,” Robinson said. “This approach can fundamentally change the way we approach these heart rhythm problems.” □

Top: This image is a fusion of a CT simulation scan and PET/CT. The PET/CT shows viable heart tissue, outlined in pink, as a structure to avoid with radiation. The red line is the target area. The green and cyan lines mark safety margins to account for motion (patient breathing and heart beat). Bottom right and left show, respectively, the coronal view and sagittal view.





Holly and Ben Allen welcome their new baby, Max, in the Women & Infants Center.



Critical connections

New integrated center changes care model for women and babies

BY KRISTINA SAUERWEIN

A new center on the Washington University Medical Campus is transforming health care for women and babies in the region. The Women & Infants Center is housed within two 12-story inpatient towers recently built by BJC HealthCare: the Barnes-Jewish Parkview Tower and a St. Louis Children's Hospital tower. A skywalk connects the labor and delivery areas in the Parkview Tower with an expanded Level IV newborn intensive care unit (NICU) in Children's Hospital, drastically reducing the time it takes to transfer critically ill newborns.

The center combines the most advanced facilities — allowing specialists to perform surgeries in the womb or manage risky deliveries — with beautiful, restful, comfortable spaces for patients.

“Women and infants remain at the center's heart. It's as good as it gets,” said George Macones, MD, head of the Department of Obstetrics and Gynecology.

Other tower floors significantly enhance and expand inpatient cancer care and pediatric care. The improvements stem from a three-year design planning process involving input from nearly 800 health-care workers, patients and family members.

MATT MILLER



MONITORING SYSTEM

Cameras are positioned over bassinets in the OR and areas where medical staff attend to newborns. The cameras let mothers watch their new babies even when they're not holding them. This is especially helpful for C-sections or multiple births.

OPERATING ROOM SIZE

As many as 40 medical professionals can work in the largest operating room, which is designed for emergencies, for complex operations such as in-utero surgeries or for multiple births.



WOMEN'S ASSESSMENT CENTER

This area allows women who think they may be in labor or who have an emergency gynecological issue to bypass the emergency room. Specialists who handle women's health issues are on call and can quickly make an assessment.



COMMAND CENTER

In the command center, nurses, doctors and other staff can monitor vital statistics for patients in labor or undergoing surgery. The stations monitor 18 labor and delivery rooms and three ORs in real time.



The three new operating rooms bring together advanced technology, medical efficiencies and a focus on patients.

Caring for mom

Mothers-to-be who deliver at the Women & Infants Center do so in an environment equipped with the top medical expertise and technology to treat serious conditions that may affect a pregnant woman or fetus. Barnes-Jewish Hospital annually cares for about 700 women from eight states who need specialized obstetric care for deliveries involving multiple births, pregnancy complications, fetal abnormalities and congenital defects in utero.

The labor and delivery floor has three operating rooms, including one for maternal-fetal surgeries that is state-of-the-art and spacious enough to accommodate up to 40 health-care workers. “This is the room where we do procedures on a fetus while still in the womb,” said George Macones, MD, the Mitchell and Elaine Yanow Professor and head of the Department of Obstetrics and Gynecology. “Having extra space is critical. One procedure, for instance, may include physicians and nurses from obstetrics, fetal medicine and anesthesia.”

Altogether, 3,300 babies were born last year at Barnes-Jewish Hospital. The center offers 52 private obstetric rooms, in addition to 18 labor and delivery rooms. The rooms have sleeper couches for family, ample outlets for charging electronics and built-in storage stocked with supplies for diapering and feeding. Android tablets installed on over-the-bed tables make it easy for the patient to contact the doctor, order food and access the internet.

The center’s care extends to all women with the new, 12-bed Women’s Assessment Center, which allows OB-GYN patients to bypass the general emergency room to receive treatment for ovarian cysts, hysterectomies and other conditions.

“We take care of women in all reproductive phases,” Macones said. “It’s one stop for women’s health.”



“It’s one stop for women’s health.”

George Macones, MD



PATIENT ROOM

Spacious, private rooms have windows overlooking Forest Park or rooftop gardens. The rooms are divided into three zones: space for family members to visit or spend the night; a place for mom and baby to rest; and areas that allow clinicians to do their work.



WOMEN’S WALK

This hallway was created for laboring women, so they won’t have to walk heavily trafficked areas. Glass walls let in natural light, illuminating work from Midwestern artists. Rails and benches are available for those who need a hand or a break.

PROTECTIVE EQUIPMENT

Even basic things like how often protective gowns are restocked can make a difference in health care. Cabinets designed to hold personal protective equipment (PPE), such as gloves and gowns, are in consistent locations and require refills only once daily, minimizing noise and traffic.



COMMUNICATION TOOL

Caregivers wear badges that show their location in real time and record when they enter and leave rooms. When in need of immediate assistance, they can press the badge to send an emergency alert. In rooms with TVs, the badges trigger a display of the name, title and photo of doctors and nurses to help patients know who's who.



SKYWALK

A skywalk links the Barnes-Jewish Parkview Tower and Children's Hospital. Before this skywalk, any trip between delivery rooms and the NICU — for newborns or mothers — required a quarter-mile journey through corridors and up and down elevators. Now the trip takes seconds.



NICU

The newborn intensive care unit is designed for families. Private rooms promote bonding and breastfeeding, and sleeper sofas and lockers make it easy for moms and other family to visit. Mothers can pump breast milk in private spaces and store it in in-room refrigerators.

IN-ROOM CHARTING AND CARE BOARD

Nurses and doctors don't have to trundle around a computer on a cart to record a patient's progress. Each room has its own computer, which folds into the wall like a Murphy bed. This in-room charting further reduces hallway traffic, keeping patient areas quieter.



The remodeled and expanded newborn intensive care unit (NICU) will hold 150 beds when the expansion is complete. The NICU design was informed by the latest neonatal care research, including studies on the importance of avoiding loud noises. The ceilings and flooring reduce noise. Private rooms cut down on infection.

Best for baby

Seconds count when treating a critically ill newborn. Before the center opened, health-care workers transporting an infant had to walk one-fourth of a mile from labor and delivery to the NICU. Now, physicians, nurses and family members have immediate access to the baby, thanks to the 110-foot skywalk connecting the two hospitals.

"We can't afford to waste any time after the mother gives birth," said F. Sessions Cole, MD, the Park J. White, MD, Professor of Pediatrics, executive vice chair of pediatrics and chief medical officer at St. Louis Children's Hospital. "The skywalk allows us to treat babies immediately so we can provide the best care possible."



"We can't afford to waste any time."

F. Sessions Cole, MD

The expanded NICU offers 37 private rooms, two of which accommodate multiples, bringing the total number of NICU beds to 125. The short skywalk jaunt from the postpartum rooms also promotes mother-baby bonding. "We include the mom as part of the infant's health therapy," said Cole, director of the Division of Newborn Medicine in the Department of Pediatrics. "Babies whose moms hold and talk to them often experience better health outcomes. For example, babies born with opioids in their system may experience less irritability and physical discomfort when moms hold them."

Intertwining mom in a baby's health-care plan also means encouraging self-care, a feat made easier because medical appointments for postpartum mothers are in the center. "This eliminates obstacles to health care such as transportation," Cole said. "Many moms put all their energy toward their babies and neglect themselves. But a well-cared for mom makes for a happier baby."

The expansion also adds 96 private patient rooms on six pediatric floors, addressing the need for more beds.

MATT MILLER



NICU ECMO

The NICU is equipped to provide extracorporeal membrane oxygenation, or ECMO, in which a machine oxygenates the blood of infants who can't breathe on their own. Children's is one of the few hospitals in the Midwest with the expertise to use this technique.

MATT MILLER



AUTOMATED GUIDED VEHICLE (AGV)

Robots called automated guided vehicles, or AGVs, transport supplies from the delivery dock to supply rooms and haul trash and other waste. AGVs have their own dedicated corridors and elevators, so patients will likely never see them.

MATT MILLER PHOTOS



Match Day 2018

On Match Day, March 16, thousands of physicians-to-be across the U.S. learned where they will train as medical residents after graduation. Of the 119 graduating Washington University medical students, 42 will train at Barnes-Jewish Hospital and four at St. Louis Children's Hospital. Altogether, this year's class will be represented at hospitals in 21 states. The largest group of students — 31 — will train in internal medicine, followed by 13 in diagnostic radiology.



CALIFORNIA

- City of Hope**
RADIATION ONCOLOGY
Elizabeth Germino
- Kaiser Permanente-San Diego**
FAMILY MEDICINE
Tarek Salih
- Santa Clara Valley Medical Center**
RADIOLOGY-DIAGNOSTIC
Dalen Kuang
- Stanford University Programs**
ANATOMY AND NEURO-PATHOLOGY
Angus Toland
PEDIATRICS
Benjamin Solomon
UROLOGY
Tianjia Jessie Ge
- UCLA Medical Center**
ANESTHESIOLOGY
Brannon Altenhofen
INTERNAL MEDICINE
Phuong Le
INTERVENTIONAL RADIOLOGY (INTEGRATED)
Shamaita Majumdar
RADIOLOGY-DIAGNOSTIC
Randy Chang
Michael Roubakha

University of California-San Diego

- OPHTHALMOLOGY
Lingling Huang

University of California-San Francisco

- FAMILY MEDICINE
Michael Snaveley
NEUROLOGY
Sarah Kaufman
PSYCHIATRY
Susan Shen

University of Southern California

- ORTHOPAEDIC SURGERY
Ramin Lalezari
THORACIC SURGERY
Jonathan Labin

CONNECTICUT

- Yale-New Haven Hospital**
OBSTETRICS AND GYNECOLOGY
Victoria Wesevich

FLORIDA

- Jackson Memorial Hospital**
ORTHOPAEDIC SURGERY
Michael Rizzo

GEORGIA

- Emory University School of Medicine**
INTERNAL MEDICINE
Sarah Wondmehen

ILLINOIS

- Northwestern McGaw/NMH/VA**
INTERNAL MEDICINE
Seren Gedallovich
RADIOLOGY-DIAGNOSTIC
Nicholas Szrama
- UIC/Mount Sinai Hospital Medical Center**
SURGERY-GENERAL
Michelle Mendiola-Pla

INDIANA

Indiana University School of Medicine

OBSTETRICS AND GYNECOLOGY
Amanda Boozalis
ORTHOPAEDIC SURGERY
Casey Beleckas

MARYLAND

Johns Hopkins Hospital

ANESTHESIOLOGY
Christelle Samen
INTERNAL MEDICINE
Nora Burdis
OTOLARYNGOLOGY
Nicholas Scott-Wittenborn

University of Maryland Medical Center

OBSTETRICS AND GYNECOLOGY
Mary Dandulakis

MASSACHUSETTS

Beth Israel Deaconess Medical Center

INTERNAL MEDICINE
Julia Berg
Ryan Kronen

Brigham & Women's Hospital

INTERNAL MEDICINE
Victor Kovac
Michelle Robinette

Children's Hospital-Boston

PEDIATRICS/URBAN HEALTH ADVOCACY-BMC
Sagar Mehta

Massachusetts General Hospital

INTERNAL MEDICINE
Monica Kasbekar
INTERNAL MEDICINE-PRIMARY CARE
Radhika Jain
INTERVENTIONAL RADIOLOGY (INTEGRATED)
Avik Som
SURGERY-GENERAL
Avril Coley
SURGERY-PRELIMINARY
Max Riley

MICHIGAN

University of Michigan Hospitals-Ann Arbor

ANESTHESIOLOGY
Shagun Mathur
INTERNAL MEDICINE
Kunal Mathur

MINNESOTA

University of Minnesota Medical School

OBSTETRICS AND GYNECOLOGY
Jessica Holttun

MISSOURI

Barnes-Jewish Hospital

CLINICAL PATHOLOGY
Gary Grajales-Reyes
DERMATOLOGY
Christopher Briscoe
Stephen Erickson
Christine Yokoyama
EMERGENCY MEDICINE
Elizabeth Christiansen
Katherine Stanley

INTERNAL MEDICINE

Bilal Al-Khalil
Eleanor Christenson
Amarilis Fernandez-Maldonado
Douglas Hall
Sonya Liu
Jeffrey Marinschaw
Patrick Olson
Cliff Pruett
Morgan Schoer
Andrea Soares
Stephanie Teja
Andrew Young
Shiyang Zhang
NEUROLOGICAL SURGERY
Diane Aum
Ridhima Guniganti
Rowland Han
NEUROLOGY
Manouela Valtcheva

OBSTETRICS AND GYNECOLOGY

Manuela Mejia
Lulu Yu

ORTHOPAEDIC SURGERY

Thomas Hong
Andrea Tian
PSYCHIATRY
Angela Lin
Dylan Powell

Joshua Siegel
Emily Slat
Lingjin Zheng

RADIOLOGY-DIAGNOSTIC

Katerina Konstantinoff
Christopher Mejias
Adam Naylor
Caroline Robb
Eric Weiner
Alec Wright
SURGERY-GENERAL
Kenneth Newcomer
Jorge Zarate Rodriguez
SURGERY-PRELIMINARY
Naveen Pokala

St. Louis Children's Hospital

PEDIATRICS
Elizabeth Daniels
Julia Kolodziej
Kristen Rosano
Jeannette Wong-Siegel

St. Louis University School of Medicine

DERMATOLOGY
Gabriela Morris
FAMILY MEDICINE
Mindy Guo

University Hospitals-Columbia

INTERNAL MEDICINE
Alexander Markov

Washington University

OPHTHALMOLOGY
Brent Bruck

NEW YORK

Hospital for Special Surgery

ORTHOPAEDIC SURGERY
Gregory Schimizzi

Montefiore Medical Center/Einstein

EMERGENCY MEDICINE
Michael Del Valle

New York Presbyterian Hospital-Columbia University Medical Center

INTERNAL MEDICINE
Laura Lee

New York Presbyterian Hospital-Weill Cornell Medical Center

INTERNAL MEDICINE
Xiaodi Wu

New York University School of Medicine

INTERNAL MEDICINE
Paolo Dib
RADIOLOGY-DIAGNOSTIC
Sindhoora Murthy
SURGERY-GENERAL
Aaron Zuckerman

NORTH CAROLINA

University of North Carolina Hospitals

ORTHOPAEDIC SURGERY/RESEARCH
Alexander Padovano

Wake Forest Baptist Medical Center

SURGERY-GENERAL
Diana Jiang

OHIO

Case Western/University Hospitals

Cleveland Medical Center
PEDIATRICS
William Cheng

Cleveland Clinic Foundation

INTERNAL MEDICINE
Rubabin Tooba

University of Cincinnati

Medical Center
DERMATOLOGY
Tyler Bauman

OREGON

Oregon Health & Science

University
EMERGENCY MEDICINE
Galen Pizzorno

PENNSYLVANIA

Hospital of the University of Pennsylvania

FAMILY MEDICINE
Rachel Springer

Wills Eye Residency Program at Jefferson

OPHTHALMOLOGY
Vikram Shankar

TENNESSEE

Vanderbilt University Medical Center

INTERNAL MEDICINE
Nowrin Haque
RADIOLOGY-DIAGNOSTIC
Jessica Miller

TEXAS

Baylor College of Medicine

INTERNAL MEDICINE-PEDIATRICS
Elizabeth Maidl
PEDIATRICS/MEDICAL GENETICS
Runjun Kumar

University of Texas Medical School

OBSTETRICS AND GYNECOLOGY
Gregory Opara

University of Texas

Southwestern Medical School

PEDIATRICS
Benjamin Masserano
RADIOLOGY-DIAGNOSTIC/RESEARCH
Dong Young Lee

UTAH

University of Utah

Affiliated Hospitals
PLASTIC SURGERY (INTEGRATED)
Bo Overschmidt

WASHINGTON

Kadlec Regional Medical Center

FAMILY MEDICINE
Jennifer Farley

University of Washington

Affiliated Hospitals
ORTHOPAEDIC SURGERY
Taleef Khan
SURGERY-PRELIMINARY
Daniel Kaufman

WISCONSIN

Medical College of Wisconsin

Affiliated Hospitals

PSYCHIATRY
Emily Rion

University of Wisconsin

Hospital and Clinics
RADIATION ONCOLOGY
Emily Merfeld

Match Day 2018 participants from former School of Medicine classes:

Anchal Bansal (2017 graduate), Anesthesiology, Barnes-Jewish Hospital

Michael Lamb (2001 graduate), Anesthesiology, University of Texas Medical Branch, Galveston

Adam Letvin (2017 graduate), Internal Medicine, University Hospitals, Columbia, Missouri

Jennifer Jupitz Pitts (2014 graduate), Radiology-Diagnostic, University of Wisconsin Hospital and Clinics, Madison

Tara Rao (2017 graduate), Internal Medicine-Primary Care, University of Wisconsin Hospital and Clinics, Madison

Tammy Ruth (2013 graduate), Pediatrics, University of Washington Affiliated Hospitals, Seattle



See more photos online:
wumcnews.org/match2018

Gaining mobility

New strategies to preserve hip function, improve outcomes

BY CHANNING SUHL

Jackie and Randy Baker understand the pain and loss of mobility associated with arthritis — and the relief of recovery. To address their arthritis, doctors at the School of Medicine's Department of Orthopaedic Surgery replaced their hips and guided them through rehabilitation. Now, with their mobility restored, the Bakers are passionate about bringing the gift of restoration to others.

Hip surgeon John Clohisy, MD, the Daniel C. and Betty B. Viehmann Distinguished Professor and chief of Adult Reconstructive Surgery, performed the Bakers' surgeries. Physiatrist Heidi Prather, DO, professor and chief of physical medicine and rehabilitation, advised the Bakers on alternative methods of relief prior to the surgeries.

Through their interactions with Clohisy and Prather, the Bakers learned about the physicians' efforts to advance the treatment of musculoskeletal disorders. As a result, the Bakers decided to make a series of financial gifts supporting the research.

The Bakers' gifts will help the physicians find solutions that range from new surgical alternatives to a fundamental shift in the care model.



John Clohisy, MD



Heidi Prather, DO

Investigating arthritis

Traditional treatment of advanced hip arthritis has centered on joint replacement surgery. These procedures are very effective for pain relief but can be associated with limited function and long-term implant failure requiring a second, riskier revision surgery.

For nearly two decades, Clohisy and his collaborators have focused on pre-arthritis and early arthritic hip disorders and hip joint replacement. The multidisciplinary team has established a world-renowned clinical practice, research unit and resident/fellow education programs. Yet, there is still a critical need for additional research to improve understanding of hip arthritis causes.

“Future strategies to cure arthritis must focus on early diagnosis and innovative treatments to preserve the natural hip joint and prevent disease progression,” Clohisy said.

These initiatives are aimed at early detection of hip disease; evaluation of newer surgical alternatives that correct abnormal hip anatomy leading to arthritis onset and progression; arthritic disease staging; and clinical outcomes of joint preservation procedures.

Clohisy’s team is investigating biological factors that can be used for disease staging and joint prognosis. To date, circulating biomarkers and joint tissue markers associated with hip arthritis progression and disease stages have not been clearly defined.

As federal funds usually are not available during the early research phase, gifts from private individuals provide extremely important start-up resources.

“We hope that this research will result in significant progress toward Dr. Clohisy’s vision to develop and refine innovative treatments to preserve natural hip joint function and prevent hip arthritis,” Randy Baker said.

Treating the whole patient

Prather specializes in the conservative management of musculoskeletal conditions, pre-arthritis hip disorders and hip and lumbar spine connections. She is past president of the North American Spine Society — the first woman elected to the position — and internationally known in the field.

The Bakers contributed in 2015 toward Prather’s musculoskeletal research.

“Over the years, several members of our family have been treated by Dr. Prather,” Jackie Baker said.



St. Louisans Jackie and Randy Baker have made a series of gifts supporting arthritis research and recovery initiatives.

“We have been impressed not only by her care for us, but especially by her interest in improving patient outcomes and well-being through interdisciplinary approaches.”

In 2017, the couple learned of Prather’s plan to create the Living Well Center at Barnes-Jewish West County Hospital, and eagerly provided funding. As the center works toward becoming a reality in 2019, Prather said, “The support of philanthropists like the Bakers is crucial.”

A collaboration between the hospital and the School of Medicine, the proposed center will provide comprehensive, interdisciplinary medical services for patients with musculoskeletal disorders.

A team of health-care professionals will identify patients at high risk for poor treatment outcomes (based on existing medical, physical and behavioral health disorders), develop individualized care plans for these patients and meet regularly to discuss their progress and any treatment barriers.

This wellness center concept is unique because it provides health-care services, such as smoking cessation, nutritional counseling and exercise instruction, which third-party payers often do not cover.

“The support of philanthropists like the Bakers is crucial.”

Through this personalized, holistic approach, the center will give patients self-care tools to positively impact their well-being. “The end goal is for patients to self-manage their musculoskeletal disorders and have improved overall health that is sustainable,” Prather said. “For surgical patients, the goal is improved pain outcomes and functionality with reduced risk of complications, in addition to improved health.”

Prather said she has not found another musculoskeletal care model that incorporates all factors known to affect treatment outcomes.

Eventually, the pilot center may expand into a regional center that anyone can access.

“By breaking down barriers to coordinated care, we hope the center will become a model for other health-care facilities,” said Jackie Baker, “and ultimately improve patient outcomes and the cost effectiveness of the health-care system.”

Before it begins

**Family, researchers team up
to cure — or even prevent —
Alzheimer's disease**

BY CHANNING SUHL

A bequest by the late Daniel J. Brennan, MD, is supporting significant advancements in Alzheimer's disease research at the School of Medicine. The disease affects 5.5 million Americans — a number expected to climb rapidly as people live longer.



Following Brennan's death in 2010, the estate gift created the Daniel J. Brennan, MD, Research Fund in the Charles F. and Joanne Knight Alzheimer's Disease Research Center (Knight ADRC). In 2017, at the family's request, a portion of the gift was used to establish the Daniel J. Brennan, MD, Professorship in Neurology, further extending its impact.



Beau Ances, MD, PhD, MSc, second from left, becomes an endowed professor. Joining in on the celebration are (from left): David H. Perlmutter, MD, executive vice chancellor for medical affairs and dean of the School of Medicine; Chancellor Mark S. Wrighton; and Daniel J. Brennan II.

Born in St. Louis, Brennan trained at Saint Louis University — earning undergraduate and medical degrees and completing a general surgery internship and residency and a plastic and reconstructive surgery residency. A gifted plastic surgeon, Brennan practiced at St. John’s Mercy Medical Center (now Mercy) until 1997 as a member of Plastic Surgery Affiliates.

As a longtime benefactor of medical education and research, Brennan chose Washington University School of Medicine for his estate gift because of its national leadership in Alzheimer’s disease research.

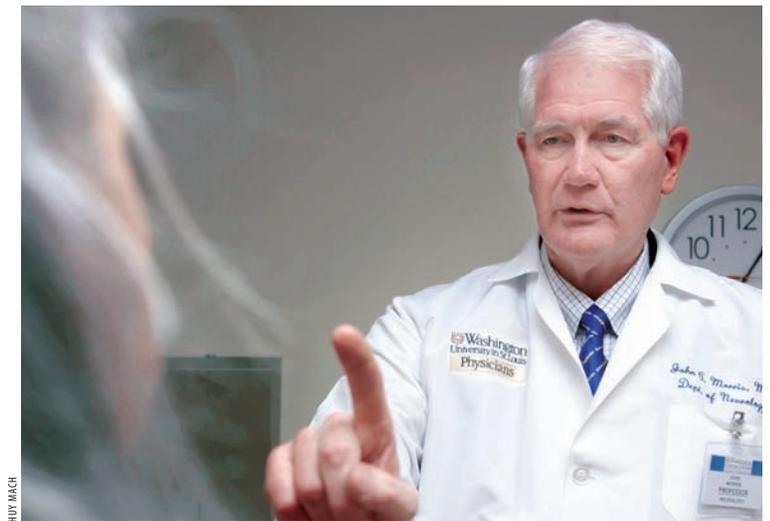
Brennan’s son, Daniel J. Brennan II, said the gift reflects the things his father valued in his own career. “My father dedicated most of his adult life to medicine — and caring for people,” he said. “It was his passion. To have his name associated with such a prestigious university, and a leader of Alzheimer’s research, fits with his desire to leave a mark. It also fits with his desire for excellence.”

Uncovering the progression

John C. Morris, MD, the Harvey A. and Dorismae Hacker Friedman Distinguished Professor of Neurology, leads the Knight ADRC, located in the Department of Neurology. The center and its clinical research arm — the Memory and Aging Project (MAP) — are at the forefront of a worldwide effort to uncover key causal factors in Alzheimer’s disease and improve early diagnosis, with a goal of finding more effective treatments, an eventual cure or even preventing the illness entirely. The researchers believe that beginning preventive treatment before brain damage occurs is essential to halting disease progression.

Morris leads a team focused on improving early-stage diagnosis, identifying preclinical stages of Alzheimer’s disease by biomarker and neuroimaging studies, evaluating new drugs for the treatment of dementia and establishing phenotypes for inherited forms of Alzheimer’s disease and other dementias. Volunteer research participants, including those who are aging normally and those with dementia, and family members have been major contributors. They take part in annual assessments through the MAP and various other studies, such as clinical drug trials, and provide biological and imaging specimens.

Morris also is the principal investigator of the Adult Children Study, a long-term study of adult children of Alzheimer’s patients — led by the School of Medicine — that aims to define who is likely to develop the disease and when, and to establish a timeline for how quickly the disease will progress. The study, which began in 2005 with funding from the National Institute on Aging of the National Institutes of Health (NIH), already has helped identify some of the molecular and structural changes in the brain that occur in the decades before a person is diagnosed with the neurodegenerative disease.



John C. Morris, MD, director of the Charles F. and Joanne Knight Alzheimer’s Disease Research Center, performs a neurological exam on a patient. A long-term study of adult children of Alzheimer’s patients aims to define who is likely to develop the disease.

Fulfilling a legacy

According to Dan Brennan II, establishing a professorship was an important step in fulfilling his father’s wishes. “As long as I can remember, he spoke of a desire to have an endowed professorship in his name as part of his legacy,” he said. “And I’m proud to have my daughters — Mackenzie, Livia, Danielle and Sylvia — involved and witness the impact of the legacy that my father has left behind.”

In February, neuroimaging expert Beau Ances, MD, PhD, MSc, was installed as the inaugural Daniel J. Brennan, MD, Professor of Neurology. Ances is a professor of neurology, neurosciences and molecular microbiology and microbial pathogenesis at the School of Medicine and of biomedical engineering at the School of Engineering & Applied Science. He also is a member of the Knight ADRC and the Hope Center for Neurological Disorders.

The Ances lab has been at the forefront of developing novel neuroimaging methods to understand the timeline of change seen in both sporadic Alzheimer’s disease and autosomal dominant Alzheimer’s disease. The vision of the Ances lab is to find neuroimaging biomarkers that will allow for Alzheimer’s disease diagnosis and evaluate the efficacy of potential therapies.

While Alzheimer’s research primarily has focused on the accumulation of the protein amyloid beta, researchers now are paying closer attention to another protein, tau. Long associated with the disease, tau is not easy to visualize through imaging and, as a result, has not been thoroughly studied.

Using a new binding agent that makes tau protein visible on positron emission tomography (PET) scans, Ances and his colleagues have shown that measures of tau are better markers of the cognitive decline characteristic of Alzheimer’s than measures of amyloid beta protein. This allows for a better understanding of Alzheimer’s progression.

Find your friends.

Classnotes are organized first by year of degree/training completion and then in alphabetical order.

How about you?

Share your news via the online form at wumcnews.org/classnotes. Submissions will be printed in a subsequent issue of Outlook magazine as space allows. Photos are welcome.

1950s



Max Heeb, MD '53, who practiced general surgery for more than 45 years in rural Missouri, received a distinguished service award from the University of Missouri School of Medicine on

April 21, 2017. He is author of the book "Max the Knife: The Life and Times of a Country Surgeon."

Roger Meyer, MD '55, stays active with volunteering, supporting peace activities with Rotary International, Peace Action with the Unitarians and the Physicians for Social Responsibility, and serves on the Oregon Health & Science University BRAINet board as historian. His work with Rotary International's Fellowship of Doctors as vice president is helping promote telemedicine and end-of-life practices. He also enjoys a busy family life with four of his six children in Portland, Ore., and looks forward to celebrating his 90th birthday in May.

1960s

Mordecai Blaustein, MD '61, recently published an invited 40-year update on an article he wrote when he was on the Washington University



faculty in 1977. In this widely cited article, he postulated that an endogenous digitalis-like compound plays a role in the pathogenesis of hypertension. The update is Blaustein's personal account of how he and his colleagues purified and identified endogenous ouabain (EO) in human plasma. The article reviews the astonishing evidence that ouabain (first identified as a plant steroid that was used as an arrow poison for centuries) is an adrenocortical hormone. EO and its plasma membrane receptor, the sodium pump, are a novel endocrine system that influences behavior, cardiovascular function, fetal development and muscle fatigue. Blaustein chaired the University of Maryland Department of Physiology from 1979-2003 and is still an active faculty member. His awards include the Pasarow Foundation Award for Cardiovascular Research, the American Heart Association Hypertension Council Novartis Award for Hypertension Research and the University of Maryland Baltimore 2002 Faculty Research Lecturer of the Year Award.

Kurt Studt, LA '63, DE '66, retired from active dental practice after more than 50 years. During his career, he taught dental students at Washington University and at Southern Illinois University School of Dental Medicine. Studt is currently an adjunct faculty member in the dental hygiene program of St. Louis Community College at Forest Park.

Lynn Taussig, MD '68, retired in December from the University of Denver, where he served as special adviser to the provost for life sciences for the past 12 years. He previously served as president/CEO at the National Jewish Medical and Research Center, now called National Jewish Health, and was on faculty at the University of Arizona College of Medicine, where he served nine years as chair of the Department of Pediatrics. Taussig is proud to have initiated the Tucson Children's Respiratory Study in 1979, a major longitudinal study of asthma risk factors in 1,246 newborns. The study continues today. One paper emanating from this study has had nearly 4,000 citations. Taussig is grateful for the many honors given by his peers and mentors, including the Alumni Achievement Award

from Washington University School of Medicine, the Distinguished Achievement Award from the American Thoracic Society, the Kendig Award from the Academy of Pediatrics, The Founders Award from the Scientific Assembly on Pediatrics of the American Thoracic Society, and election into the Colorado Pulmonary Hall of Fame.

1970s

Richard Wahl, MD '78, HS '83, the Elizabeth E. Mallinckrodt Professor of Radiology and director of the Mallinckrodt Institute of Radiology, **Samuel I. Achilefu, PhD**, the Michel M. Ter-Pogossian Professor of Radiology, and **Pamela K. Woodward, MD**, professor of radiology, recently received a five-year, \$933,700 grant from the National Institutes of Health (NIH) for Training Opportunities in Translational Imaging Education and Research (TOP-TIER). This new interdisciplinary clinician-scientist postdoctoral program will prepare residents and fellow trainees on how to bring preclinical imaging innovations to patients and the practice of medicine.

1980s



Joseph Moskal, MD '81, chair of the Department of Orthopaedic Surgery for Carilion Clinic and the Virginia Tech Carilion School of Medicine, has been appointed to the Dean's Council

on Advancement for the Virginia Tech Carilion School of Medicine. The council is a committee of volunteers created to advance the stature of the medical school by providing guidance, assistance, advocacy and philanthropic investment in support of the school's strategic objectives.

Raymond Curry, MD '82, was recognized by the Northwestern University Feinberg School of Medicine with the creation of a named professorship in medical education, endowed by an anonymous donor in honor of his 16 years



of service to the institution as vice dean for education. Curry is now the senior associate dean for educational affairs at the University of Illinois College of Medicine and clinical professor of medicine and medical education at the University of Illinois at Chicago.

Sándor J. Kovács, PhD, MD, HS '85, professor of medicine and of cell biology and physiology, was honored with a Lifetime Achievement Award from the Barnes-Jewish Hospital Medical Staff Association. The award was presented at the association's semi-annual general staff meeting, April 13, 2017.

1990s



Audrey Shillington, SW '87, SW '91, GM '93, director of the Colorado State University School of Social Work, assumed responsibilities as associate dean for academic affairs in the

College of Health and Human Sciences in June 2017. Shillington remains director of the social work school and is professor of epidemiology at the University of Colorado School of Public Health. She was a National Institute of Mental Health postdoctoral fellow and earned a master's degree in psychiatric epidemiology from Washington University School of Medicine. She has published in the areas of psychometrics, epidemiology, prevention and intervention work aimed at adolescent and young adult risk behaviors. She has been principal investigator and co-investigator on grants totaling more than \$14 million, including those from the National Institutes of Health (NIH), the National Institute on Drug Abuse and the National Institute on Alcohol Abuse and Alcoholism. Her current work focuses on intervention and prevention related to the changing landscape in legalization of recreational marijuana use.

Michael Raney, MD '94, a radiologist with West County Radiological Group in St. Louis, was elected secretary-treasurer of the Missouri Radiological Society.

Bryan Gibby, PT '95, is a certified wound specialist at St. Luke's Elks Wound Center in Boise, Idaho.

Deborah Veis Novack, MD '95, PhD '95, participated in the Rally for Medical Research in Washington, D.C., in September 2017. This annual event brings together 300-plus researchers, clinicians and patient advocates from hundreds of organizations to meet in the offices of senators and representatives to demonstrate the value of medical research to all citizens. Through this type of advocacy, Congress has provided \$2 billion increases in National Institutes of Health (NIH) funding each of the last two years, and a similar increase is proposed for the FY2018 budget.

Bryan Meyers, HS '98,

chief of the general thoracic surgery section at Washington University School of Medicine, has been named chair of the American Board of Thoracic Surgery. He will serve as chair for two years.



Edward Garon, MD '99, director of the Thoracic Oncology Program at the Jonsson Comprehensive Cancer Center at the University of California, Los Angeles, and associate professor of medicine

in the Division of Hematology-Oncology at David Geffen School of Medicine, joined LUNGeVity's scientific advisory board, a group of 19 world-renowned scientists and researchers who guide LUNGeVity's scientific strategy and research program. LUNGeVity focuses on early detection of lung cancer.

2000s

Jimmy Kerrigan, MD '10, is an interventional cardiology fellow at Cleveland Clinic and is married with children.

Vanessa Williams, LA '06, MD '10, is an assistant professor of radiology at the University of Kansas. She is married with children.

Tassy Hayden, LA '07, MD '11, practices at Southampton Healthcare in St. Louis, a large primary medicine group with an emphasis on caring for the LGBT community.

David Jin, EN '06, MD '11, is a clinical research fellow in gastroenterology, hepatology and endoscopy at Brigham and Women's Hospital at Harvard Medical School.

Jesse Otero, MD '11, PhD '11, is an orthopaedic surgeon at the University of Iowa Hospitals and Clinics. He is married with children.

Catherine Butler, MD '12, is a research nephrology fellow at the University of Washington.

Adam Rouse, EN '04, SI '12, MD '12, is a research assistant professor in neuroscience at the University of Rochester and received a National Institutes of Health (NIH)/ National Institute of Neurological Disorders and Stroke K99/00 grant in April 2017.

Lucy Zhang, MD '12,

of San Francisco, is an ophthalmologist with Peninsula Ophthalmology Group at its Daly City and Burlington, Calif., offices.



Yi Wang, MD '13, of Houston, recently was married and traveled to Italy on her honeymoon and describes it as a beautiful and poignant experience. She is happy to report having survived Hurricane Harvey without much damage. Wang works as a pediatrician at Legacy Community Health.

Megan Cook, PT '14, was married to Aaron Shoppa in September 2017. She is a physical therapist at Advocate Children's Hospital in Oak Lawn, Ill.



Jennifer Jupitz, MD '14, is stationed at Camp Lejeune in North Carolina serving as the physician to a squadron in the U.S. Marine Corps. She was married in 2016, and she and her husband

welcomed a baby boy in fall of 2017.



David A. Bensinger, LA 43, DDS, former dean of Washington University's School of Dental Medicine, died Saturday, July 22, 2017, in San Francisco. He was 91.

Bensinger joined the faculty in 1948 as an instructor of dental medicine. He became an associate professor in 1956, was named assistant dean in 1967, associate dean in 1973 and full professor in 1976. A major renovation of the School of Dental Medicine building was completed under his supervision in 1972. In 1987, Bensinger was appointed dean, serving until his retirement in 1989. The Washington University Alumni Association named him *Alumnus of the Year* in 1968, honoring his work to prevent closure of the school the previous year.

A specialist in periodontics, Bensinger served as president of the Midwestern Society of Periodontists; he also served as president of the Missouri Dental Association and was also a fellow of both the American College of Dentists and the International College of Dentists.

He is survived by his wife of 42 years, Susanna; children and step-children Judith (William) Haynes, Scott (Vicki) Bensinger, Ruth Hartman (Gary Wolff), Emily (Avraham) Eisbruch and Sara Yashar (Mayer z"l); 11 grandchildren and three great-grandchildren.

Ari Nachum Berlin, MD,

a pediatric intern at St. Louis Children's Hospital and a 2017 graduate of the School of Medicine, died Feb. 23, 2018, in St. Louis, after a 2 ½-year battle with pancreatic neuroendocrine cancer. He was 27.



Berlin grew up near Boston. He earned a bachelor's degree in chemistry in 2012 at Rice University.

He met his future wife, Hallie Morris, while both were students at the School of Medicine. The couple married Jan. 7, 2017, and worked together for a brief time at St. Louis Children's Hospital. Morris, MD, is a fellow in newborn medicine.

Berlin was diagnosed with cancer while in medical school. Following his diagnosis, his parents moved to St. Louis from Massachusetts to offer additional support. Berlin is survived by his wife; his parents, Kenny Berlin, MD, and Marsha Ross-Berlin, DMD; a brother, Josh Berlin; a sister, Jessie Berlin; and his grandmother, Maxine Berlin.



Arthur Z. Eisen, MD, a physician-scientist who founded and led the Division of Dermatology, died Sunday, Nov. 12, 2017, in St. Louis after a short illness. He was 88.

Eisen founded the division in 1967 and remained its director for more than 30 years. During that tenure, he was the Winfred A. and Emma R. Showman Professor of Dermatology. Until his retirement last year, he remained active in clinical medicine and resident education.

"Dr. Eisen was one of the true giants in the field of dermatology," said Lynn Cornelius, MD, director of the Division of Dermatology. "He embodied the quintessential 'triple threat' throughout his illustrious career — outstanding in research, clinical medicine and education."

Eisen was considered a longtime leader in connective tissue research. He focused on the genetic underpinnings of skin diseases and the role enzymes play in remodeling tissue, and was particularly interested in the cells that synthesize collagenase-1 in the dermal layer of skin.

He earned a bachelor's degree from the University of Buffalo in 1951, a master's degree from Brown University in 1953, and a medical degree from the University of Pennsylvania in 1957. He completed an internship, residency and fellowship at the University of Rochester School of Medicine and Dentistry.

Eisen is survived by his wife of 59 years, Mimsie Eisen; their son, Marshall (Gail) Eisen; daughters Phyllis (Alex) Kane, and Leah (Steve) Pazol; and several grandchildren.



Stephen L. Johnson, PhD, a national leader in the field of zebrafish genomics and a professor of genetics, died at his home Friday, Dec. 15, 2017, after a long struggle with

rheumatoid arthritis. He was 56.

Johnson guided the development of zebrafish as an important research model, similar to fruit flies and mice. With transparent embryos, zebrafish are ideal for studying growth and development.

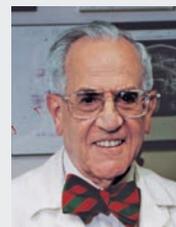
Johnson's zebrafish studies have shed light on how tissues regenerate and how organisms control the size of their organs. He was particularly interested in understanding cells called melanocytes, which are best known for governing skin pigmentation and are the cell type affected in the deadliest form of skin cancer, melanoma. Johnson developed methods to track the fate of these cells as they develop from the early embryo to the adult zebrafish.

Johnson earned a bachelor's degree in chemistry and molecular biology at Vanderbilt University, followed by a doctoral degree in genetics from the University of Washington, Seattle. He continued postdoctoral training at the University of Oregon before joining the Washington University faculty in 1996.

Johnson is survived by his sister, Susan C. Johnson; his brother, Lee Johnson; and several nieces.

William M. Landau, MD,

a professor emeritus of neurology, died in his sleep Thursday, Nov. 2, 2017, at his home in University City. He was 93.



Landau was a professor of neurology from 1954 to 2012 and served as head of the Department of Neurology from 1970 to 1991. He was the longest-serving faculty member at the School of Medicine.

Landau specialized in movement disorders such as Parkinson's disease, but his interests ranged widely. With Frank Kleffner, of the Central Institute for the Deaf, he identified and described Landau-Kleffner syndrome, a rare disorder in which

children lose the ability to speak and respond to language. He also studied how patients fared who were revived with CPR after their hearts had stopped beating, and concluded that the risk of severe, debilitating brain damage was under-appreciated. He advocated for more limited use of the procedure.

The Department of Neurology established the William & Pudge Landau Lectureship in Neuroscience and Society in honor of Landau and his wife, known as Pudge, whom he married in 1947. Along with his scientific accomplishments, Landau was known for his commitment to social justice.

Landau was born just a few blocks from Washington University in 1924. He started college at the University of Chicago in 1941, but the United States' entry into World War II accelerated his college career, and after just two years, he returned to St. Louis to begin medical studies at Washington University School of Medicine. He was 18.

In addition to his daughter, Julie Landau-Taylor, he is survived by three sons, David Landau of St. Louis, John Landau of New Jersey and George Landau of Philadelphia; 11 grandchildren; and four great-grandchildren.

Arthur DeCosta Loewy, PhD, professor of anatomy and of neuroscience, died Saturday, Dec. 2, 2017, of complications related to inflammatory bowel disease and other health issues. He was 74.



Upon joining the School of Medicine faculty in 1975, Loewy focused his research on the ways the brain regulates bodily functions such as blood pressure. He is best known for discovering the anatomical basis of the fight-or-flight response. Early in his career, he used radioactively tagged molecules to trace the pathway that connects the brain to the pacemaking neurons in the heart.

Loewy earned a bachelor's degree in mathematics from Lawrence University in Appleton, Wis., followed by a doctoral degree in anatomy from the University of Wisconsin, Madison.

Loewy was preceded in death by his wife, Arleen Loewy, who also had worked at Washington University. In addition to his son, Adam Loewy, he is survived by his daughter-in-law, Philippa (Rudolph) Loewy; his long-term girlfriend, Karen Frahm; a grandson; and his daughter-in-law's parents, Christy Twin and Larry Rudolph.



John E. Majors, PhD, professor emeritus of biochemistry and molecular biophysics, died Wednesday, Jan. 10, 2018, of a heart attack. He was 69.

Majors was known for key contributions to the field of molecular biology, particularly involving the expression of genes in yeast and viruses. He worked with a team led by Harold E. Varmus, MD, and J. Michael Bishop, MD, whose research revealing how viruses can cause cancer was honored with the Nobel Prize in Physiology or Medicine in 1989.

According to colleagues, Majors was deeply committed to mentorship and training, putting students at the center of his work. He served on the doctoral thesis committees of more than 100 graduate students in the Division of Biology & Biomedical Sciences (DBBS). In 2013, he was one of 10 DBBS faculty named to "The One Hundred Club," honoring this achievement. Many of his former trainees have gone on to become leaders in their fields.

Majors earned a bachelor's degree in physics from the University of Washington in 1970 and a doctoral degree in biophysics from Harvard University in 1977. He trained as a postdoctoral fellow in Varmus' lab, then at the University of California, San Francisco — contributing to the discoveries that would later earn Varmus and Bishop the Nobel Prize.

He joined the Washington University faculty in 1983. After his retirement in 2011, he continued teaching regularly for the university's Department of Biology.

Majors is survived by his sisters, Anne Chick and Jane Sutherland, and their families.

Eric P. Newman, JD, St. Louis businessman, scholar and philanthropist — an alumnus and major benefactor to Washington University — died Wednesday, Nov. 15, 2017, at his home in Clayton. He was 106 years old.



Born in St. Louis, Newman graduated from John Burroughs School in 1928 and Massachusetts Institute of Technology in 1932. He graduated from Washington University's School of Law in 1935.

Following World War II, Newman began his career at Edison Brothers Stores Inc., where he was an officer and served on the board until his retirement. From 1988-2005, he served as president of the Harry Edison Foundation.

One of the foremost American numismatists, Newman wrote more than 100 books and articles, including the pioneering study "The Early Paper Money of America" (1967), which remains a standard in the field. His private collection of U.S. and Colonial American coins and paper money is considered one of the nation's finest.

Newman and his family extended extraordinary generosity to a wide range of Washington University schools and programs. At the School of Medicine, the family helped underwrite the Eric P. Newman Education Center and endow two professorships, in addition to supporting many other programs.

Newman was preceded in death by his wife of 75 years, Evelyn. He is survived by his son, Washington University trustee Andrew E. Newman of St. Louis; daughter, Linda Newman Schapiro of New York; five grandchildren; and 10 great-grandchildren.



John A. "Jack" Pierce, MD, former director of pulmonary and critical care and emeritus professor of medicine, died Friday, Nov. 24, 2017, in St. Louis following a long battle

with cancer. He was 92.

Pierce came to the university in 1967 as the first director of the Division of Pulmonary

and Critical Care Medicine. He also served as chief of pulmonary and critical care medicine at the St. Louis Veterans Affairs Medical Center.

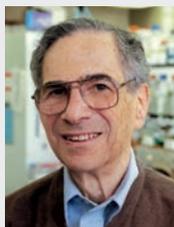
In 1984, Pierce was named the inaugural Selma and Herman Seldin Professor of Medicine. He became an emeritus professor in 1993, but continued to work with medical students and trainees until recently.

Pierce created the first respiratory intensive care unit (ICU) at what was then Barnes Hospital, which was one of the first such ICUs in the country. He also launched and directed one of the first National Institutes of Health (NIH)-sponsored pulmonary research training programs in the country.

Pierce's research helped clarify the roles of specific enzymes in the development of emphysema.

Pierce is survived by his wife of 33 years, Susan (Ellis) Pierce; his children, Sheryl, John Jr. (Margarita) and Robert (Dawn) Pierce; his wife Susan's children, Kerstin Starzer (Daryl) and Nissa Fendler (Mark); 12 grandchildren; and four great-grandchildren.

Milton J. Schlesinger, PhD, professor emeritus of molecular microbiology, died of heart failure Friday, Oct. 27, 2017, at his home in Berkeley, Calif., after a long period of illness. He was 89.



Schlesinger was a professor of microbiology (later, molecular microbiology) from 1964 until 1999. During his tenure, he twice served as acting head of his department.

Schlesinger wrote a definitive history of the microbiology department, starting from its inception to the present day. He was named an emeritus professor in 1999.

His work focused on diverse aspects of viral assembly and replication. "Milton was one of the first to use the power of defined viral systems to probe fundamental processes of protein folding and modification, in advance of the recombinant DNA revolution," said Stephen M. Beverley, PhD, the Marvin A. Brennecke Professor and head of the Department of Molecular Microbiology.

Schlesinger and his wife of 62 years, Sondra Schlesinger, PhD — a Washington University professor emerita and an

occasional scientific collaborator with her husband — moved to Berkeley in 2003, but were frequent visitors to St. Louis and maintained a strong interest in the department.

He is survived by his wife.

Raymond H. "Ray" Wittcoff, an emeritus Washington University trustee and a member of the School of Medicine's National Council since 2005, died Tuesday, Jan. 2, 2018, at his home in Phoenix. He was 96.



Wittcoff was elected to the Board of Trustees in 1974. He and his wife, Roma, also an emeritus trustee and School of Medicine National Council member, have been long-time supporters of Washington University.

The Wittcoffs helped fund university building projects, program initiatives, scholarships and professorships.

A real estate developer, philanthropist, civic leader and visionary, Wittcoff helped bring public television to St. Louis as a co-founder of KETC/Channel 9.

Wittcoff also was chair of the board of directors of Washington University Medical Center and of Jewish Hospital (now Barnes-Jewish Hospital). He was instrumental in inaugurating the Washington University Medical Center Redevelopment Corp. In 1986, he established the Raymond H. Wittcoff Professorship in Biological Chemistry at the School of Medicine.

A St. Louis native, Wittcoff earned a bachelor's degree from the University of Chicago in 1942, then served as a Navy lieutenant in World War II.

In addition to his wife, Wittcoff is survived by his son, Mark; daughter, Caroline; five stepchildren, Joel, Richard, Melanie, Marna and Debbie Broida; four grandchildren; seven stepgrandchildren; and one stepgreat-grandson.

**For full obituaries, visit:
wumcnews.org/obits**

1940s

Elbert H. Cason, MD '42; Oct. '17
Roger E. Fox, MD '49; Jan. '18
Louis O. Lambiotte, MD '45; Nov. '17
Rudolph J. Maffei, MD '48; Oct. '17
Annetta McMahan, NU '42; Nov. '17
Roberta G. Middelkamp, NU '49; Feb. '18
William W. Regan, MD '47; Oct. '17
David E. Smith Jr., MD '44; Nov. '17

1950s

Allie Dunlevy, NU '50; Aug. '17
Joan Edwards, NU '51; Sept. '17
Gerald E. Hanks, MD '59; Dec. '17
Robert J. Hickok, PT '53, HA '71; Jan. '18
Carl A. Hirsch, MD '59; Dec. '17
Everett L. Jung, LA '49, MD '55; Nov. '17
Jo Ann Koehler, NU '53; Jan. '18
Patricia Kolditz, NU '51; Dec. '17
Percy E. Luecke Jr., MD '52; Oct. '17
Jean Matthews, PT '55; Oct. '17
Larry L. McCune, DE '55; Jan. '18
Paul S. Meyer, DE '55, GD '58; Dec. '17
Enoch E. Morrow, DE '53; July '17
May Yamamoto Omura, NU '51; Aug. '17
Lothar H. Pinkers, MD '55; July '17
Robert M. Roy, HS; Oct. '17
Mary Lynne Ruddon, PT '58; Nov. '17
Olga S. Smith, OT '55; Jan. '18

1960s

Duane E. Christian, DE '60; Oct. '17
Richard P. Jacobs, MD '69; Jan. '18
Leonard Jarett, MD '62; Jan. '18
William G. Juergens Jr., MD '61; Jan. '18
Azmi H. Khazin, LA '57, MD '61; Dec. '17
Elizabeth C. Sowa, MD '63; Oct. '17
H. Goff Thompson Jr., LA '57, MD '61; Dec. '17
Carol F. Williams, HS '60; Jan. '18

1970s

Sharon S. Crandell, MD '74; Oct. '17
Michael Bruce Deldin, MD '75; Dec. '17

1980s

Craig W. S. Howe, HS '81; Jan. '18
Kevin T. McDonagh, HS '87; Dec. '17

1990s

Richard Ceenan Tam, MD '99; Jan. '18

Medical student Iris Kuo visits with patient Jerry McCaleb.



MATT MILLER PHOTOS



Top: Kuo presents patients with floral crowns. Bottom: Maria Baggstrom, MD, left, helps others make haku lei at a workshop.

'When you make a lei, you're putting a piece of yourself or your spirit into it for the recipient.'

First-year medical student Iris Kuo's classmates were intrigued by the lovely haku lei — a floral crown — Kuo wore at White Coat ceremony in the fall. Eager to share her Hawaiian culture with classmates, the Honolulu native arranged a workshop to teach them how to make the colorful crowns. But before long, the idea blossomed into something even more meaningful: an opportunity to show kindness to patients coping with cancer. Some 50 medical students, faculty, members of the Hawaii Club on the Danforth Campus, and St. Louis community members with ties to Hawaii, made the floral crowns. The crowns were delivered May 1 — Lei Day in Hawaii — to patients at Siteman Cancer Center. "It was my hope that, through the haku lei, the patients would feel our hope, support and aloha for a moment in their healing process," Kuo said.

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Changing the skyline Two 12-story inpatient towers built by BJC HealthCare on the Washington University Medical Campus are enhancing patient care. One of the buildings is the Barnes-Jewish Parkview Tower, which offers roomy, modernized facilities for patients of Siteman Cancer Center and of the Women & Infants Center. The other is a St. Louis Children's Hospital tower featuring an expanded newborn intensive care unit (NICU) and more pediatric beds. A skywalk now connects labor and delivery areas in the Parkview Tower with the Children's Hospital NICU. Almost 800 health-care workers, patients and families contributed to the design process.

