EMORY
UNIVERSITY
SCHOOL OF
MEDICINE

Department of Radiology
and Imaging Sciences

our 2018 ANNUAL REPORT

ourpeopleourpatientsourpromise

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Photo at right (l-r): Musculoskeletal radiologist Monica Umpierrez, patient services coordinator Claudia Casserly-Hinds, and MRI technologist Zach Conrad with the Carestream Cone Beam CT.

CHAIR'S MESSAGE

As we launch our Emory Radiology 2018-2022 department strategic plan, "Designing the Destination," there is a palpable excitement in the air. Our journey continues to lead us to build on our innovation culture through collaboration and fearless inquiry. At the heart of it all are the people of our department who make this a great place to be. Our shared focus on delivering patient-centered imaging care pushes us to continuously strive for excellence in all our missions.

Investing in our people has served us exceedingly well. Our talent is both locally grown and from all points of the globe. Our intentional goal—to create a diverse and inclusive community—is a great source of pride. It makes us stronger, more creative, and better suited to meet the changing needs of academic medicine. Notably, this year we launch the tenth class of the Radiology Leadership Academy, which is our flagship program for bringing out the best in new department leaders.

Our quest for caring for a growing patient population can challenge and geographically fragment our resources. In our strategic plan, we commit to ensuring a cohesive One Emory Radiology environment, which is the essence of what makes our institution and department exceptional. As always, the health and well-being of our patients drives us to great heights.

Carolyn Cidis Meltzer, MD
Chair, Department of Radiology and Imaging Sciences

VISION

Emory Radiology and Imaging Sciences will be a destination for those who seek excellence and continuous innovation in medical imaging.

MISSION

The Emory Department of Radiology and Imaging Sciences is a community dedicated to the promotion of health, discovery and innovation, and educating the future healthcare workforce. We embrace and celebrate a collaborative culture, adaptive approaches to continuous innovation, and aligned partnerships in patient-centered care.

STRATEGIC PLAN 2018-2022

Designing the Destination

Goal 1: To enhance the Emory Radiology employee experience, we will:

- Elevate and uphold our commitment to diversity, equity, and inclusion.
- Optimize the way we attract, select, integrate, engage, and advance our people.
- Promote and support a culture of employee well-being.
- Foster a workplace community of engaged individuals and high-functioning teams.

Goal 2: To optimize service and outcomes to Emory Radiology patients, families, and our partners in care, we will:

- Improve patients' access to our services and their pre-visit experience.
- Optimize the patient visit experience, with a focus on wait times and communication.
- Enhance the service experience for our referring providers.

Goal 3: To foster a "One Emory Radiology" community for our faculty, staff, learners, and those who interact with us, we will:

- Embrace a set of core values and a common language reflective of our mission and vision.
- Encourage collaboration through inter-site exchange and relationship building.
- Promote "systemness" through a dedicated team of global liaisons.

Goal 4: To drive continuous innovation through our work, we will:

- Build the infrastructure to support highly innovative work.
- Recruit and retain the talent required to drive innovation.
- Establish synergistic partnerships within and outside of Emory.
- Attract and secure extramural funding for innovative programs and projects.

Learn more about Clinical Care online by scanning the QR code above using your favorite QR reader app.

Photo at right: Thanks to interventional radiologist Sherif Nour, (center), Avis Weaver (left) is cancer-free and celebrates with her daughter, Shezza Shagarabi.

As neuroradiologist **Amit Saindane, MD, MBA**, vice chair of clinical affairs, notes, patient-centered care requires accurate and timely imaging using imaging modalities such as radiography, fluoroscopy, ultrasound, computed tomography (CT), magnetic resonance imaging (MRI), or positron emission tomography (PET) to diagnose and plan treatment for everything from broken bones to heart disease and stroke. Care advances with image-guided treatment for conditions like vascular malformations and cancers. Nearly 80% of Emory Healthcare's patients benefit from Emory Radiology's expertise: the department completed more than 1.2 million imaging studies in 2017 at seven hospitals and dozens of clinics around metro Atlanta.

Emory Radiology has 11 clinical divisions:

- Abdominal Imaging
- Breast Imaging
- Cardiothoracic Imaging
- Community Radiology Specialists
- Emergency and Trauma Imaging
- Interventional Radiology and Image-Guided Medicine
- Interventional Neuroradiology
- Musculoskeletal Imaging
- Neuroradiology
- Nuclear Medicine and Molecular Imaging
- Pediatric Imaging

Some divisions organize according to body systems and imaging modalities, while others utilize multispecialty, multimodality approaches.

1.1. KIDNEY CANCER CURE

Avis Weaver felt healthy, eager to take on the world after shedding over 100 pounds, earning her master's degree in social work, and making other important life changes. With a new lease on life, she opted for some plastic surgery.

Shortly after, however, Avis felt a knife-like pain in her side. Her surgeon, Emory's **Angela Cheng, MD**, ordered an ultrasound. A suspicious finding unrelated to the surgery was confirmed by subsequent MRI: renal cell carcinoma, an aggressive kidney cancer.

"The room started spinning," Avis says. "How could I feel so alive and have a deadly cancer?"

Avis saw a string of specialists elsewhere. With the lesion in a difficult place, they recommended surgery with an incision made front to back. One wanted to remove the entire kidney. Another suggested partial nephrectomy but warned about post-surgery kidney failure. Both worried about traumatizing the liver. A third focused more on finances than treatment. All expected prolonged recovery with no guarantees.

"I was devastated," Avis recalls. "It made no sense. How could this be happening?"

Coming from a medical family—her brother and father are doctors, her older son is in medical school, and her daughter just earned an MPH from Emory—Avis found another option: image-guided laser ablation. An interventional radiologist across town, however, chastised her for wanting "the latest and greatest technique touted online" instead of "standard treatment."

Feeling her new lease on life slipping away yet

"The technique is complex, but the feeling from saving a life is unequaled."

Sherif Nour, MD

refusing to give up, Avis returned to Emory, where urologist **Viraj Master, MD, PhD**, referred her to **Sherif Nour, MD**, director of Emory's Interventional MRI Program. With Emory Radiology, Avis says, everything felt different. First, **Debra Weber, RN**, care coordinator, met with Avis. "Just Debra's words made me feel at ease."

When Dr. Nour came in, Avis says, "It was clear he had reviewed my images. He talked about what he saw and how he could treat it. And then he looked at me and said he absolutely could help me. At that moment, I felt like he saw me as a person and I was going to be okay."

Four weeks after Avis' initial diagnosis, Dr. Nour eradicated the cancerous lesion using laser ablation guided by magnetic resonance imaging with an open bore, 1.5T MRI machine.

"Using MRI lets you see the lesion and its margins very clearly so you can precisely position the laser," explains Dr. Nour. "MRI also lets you see temperature, so you can apply the laser with confidence and easily monitor ablation progress."

Avis went home that afternoon with a Band-Aid over a small incision in her back, her kidney intact. She took only ibuprofen at home and resumed normal activities in a few days. Three months later, she feels good, and her MRI and blood tests detect neither cancer nor reduced kidney function.

Dr. Nour's team provides the highest quality patient care before and after the procedure. Joining Debra Weber are MRI technologist **Kenny Doan** and nurse practitioner **Tracy Powell**. They helped Dr. Nour complete 50 cancer ablations in 2017. Emory's Interventional MRI Program, one of only a handful worldwide, is a leader in MRI-guided interventions.

"The technique is complex," Dr. Nour admits, "but the feeling from saving a life is unequaled. To have a patient arrive with cancer and leave without cancer, there's nothing better."

An exuberant Avis Weaver agrees. "I knew I had to battle cancer to save my life, but I never thought I'd have to battle for the right treatment, too. God brought me to Emory, and Dr. Nour was my match made in heaven."

Avis now is giving back as the newest member of the Radiology Patient-Family Advisory Council.

1.2. EMORY EXCELLENCE CLOSE TO HOME

The Division of Community Radiology Specialists (CRS) brings Emory Radiology's world-class imaging services to metro Atlanta's suburbs. CRS serves the 110-bed Emory Johns Creek Hospital in northern Fulton County and the 410-bed Emory Saint Joseph's Hospital in DeKalb County, as well as outpatient imaging centers in Cobb, Forsyth, and Henry counties.

The division's 12 radiologists routinely interpret imaging studies across a range of modalities and body systems. They also are specialists with advanced training in abdominal, cardiothoracic, neuro, and interventional radiology (IR), so patients with complex health conditions don't have to travel far for cutting-edge imaging and image-guided procedures, says **Howard**

Photo at right: From left: Staff RNs Mandi Erwin and Laura Austin, APP nurse practitioner Patrick Hickey, and staff RN Walter Auker of the Emory Johns Creek Hospital Radiology Observation Care Unit.

Fleishon, MD, MMM, division director and chief of radiology services at Emory Johns Creek Hospital.

CRS shoulders administrative and clinical leadership responsibilities at both hospitals. Daily Radiology team huddles focus everyone on patient safety and comfort and workflow efficiency. Referring physicians collaborate with CRS radiologists as part of a patient's treatment planning. Patients also can talk directly with CRS radiologists about their findings.

Emory's CRS division is highly respected and emulated for integrating radiology professionals serving community hospitals with their peers in an academic medical center. CRS faculty have published and presented widely about their innovative multispecialty workflow and clinical practice models.

For example, the new Radiology Observation Care Unit (ROCU) in Emory Johns Creek Hospital provides dedicated space for CRS radiologists, advanced practice providers (APPs), and technologists to guide complex interventional procedures using CT, ultrasound, and MRI to diagnose and treat a range of conditions.

"Excellence in the ROCU is built on a collaborative, team approach to care," says Dr. Fleishon.

Curved computer workstations create a command center where team members collaboratively manage up to 20 procedures a day. Private rooms, easily visible and quickly accessible from that center, are fully equipped for monitoring patients before and after procedures.

Team members work together, following strict protocols for patient safety while also making patients feel comfortable. Sometimes that's as easy as playing a patient's favorite music. Other times it requires more, as physician assistant and APP **Hilary Karp** knows.

As an IR proceduralist in the ROCU, Hilary treats patients like Mr. P, whose liver was ravaged by autoimmune hepatitis. Every week for a year, ultrasound imaging helped Hilary guide a hollow needle into Mr. P's abdomen to drain fluid accumulating due to liver failure without damaging nearby organs. Called paracentesis, it's one of nearly 20 image-guided procedures Hilary performs. She also uses CT guidance to perform bone marrow biopsies and fluoroscopy to guide placement of IV ports and dialysis catheters.

For Mr. P, weekly visits to the ROCU relieved more than pressure from the fluid.

"He was losing hope he'd get a liver transplant. It broke his heart to think of leaving his students, his wife, and his two kids," Hilary recalls. "While the fluid drained, he would share his fear with me and I would hold onto it for him. I shared my experiences working on the organ transplant team, and he'd find new hope."

The weekly visits ended a year ago, but Hilary joined the family recently to celebrate Mr. P's "liver-versary."

"Seeing him so well a year after his transplant, celebrating with his family, that's the reward."

1.3. PREPARING FOR MASS CASUALTIES AND DISASTERS

The Division of Emergency and Trauma Radiology deploys its subspecialty-trained radiologists to meet growing demand for both emergency department imaging services and STAT inpatient examinations at Emory University Hospital, Emory University Hospital Midtown, Wesley Woods, Emory University Orthopaedic & Spine Hospital, and Grady Memorial Hospital. It is led by **Jamlik-Omari Johnson, MD**, who also is chief of radiology at Emory Midtown.

The division additionally plans Radiology's response to mass casualty events. Imaging services are vital to an effective medical response to natural disasters, large-scale aviation or vehicular accidents, and even tragedies like mass-scale shootings. Enter **Krystal Archer-Arroyo, MD**, an emergency and trauma imaging specialist and director of Emory Radiology Critical Event Preparedness and Response.

Since joining the Emory Radiology team in August 2017, Dr. Archer-Arroyo has visited every Emory hospital to assess Emory Radiology's capacity for responding to catastrophic events. She has reviewed existing protocols and is drafting the department's consolidated plan. That plan feeds and is informed by Emory's Office of Critical Event Preparedness and Response (CEPAR), which leads Emory's enterprise-wide planning for and coordinated response to catastrophic events affecting Emory and the broader community. Dr. Archer-Arroyo serves as a member of the CEPAR working group.

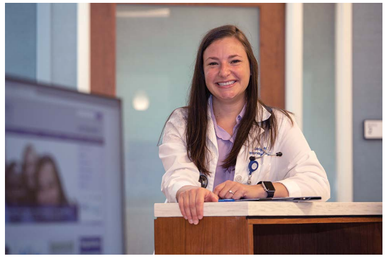
Plans will be finalized by early 2019, and work will begin on department-wide training and capacity building activities, including drills like the Joint Crisis Exercise held in April 2018 involving Emory, the Centers for Disease Control and Prevention, and the Atlanta Urban Area Security Initiative.

Dr. Archer-Arroyo's work is ensuring Emory Radiology is well positioned to effectively deploy human and technology resources across the system when disaster strikes.

1.4. MUSCULOSKELETAL AND SPORTS MEDICINE IMAGING

Emory's Division of Musculoskeletal Imaging (MSK) deals in bones, cartilage, and supporting soft tissue. Led by **Monica Umpierrez, MD**, MSK's five radiologists and four MSK fellows provide diagnostic imaging interpretation across the Emory enterprise. They perform advanced imaging like ultrasound tendon elastography to diagnose tendon pathology, MR neurography to diagnose nerve injuries, and image-guided procedures (e.g., medication injections; aspiration of joint fluid; and biopsies of joints, tendon sheaths, bones, and soft tissues) employing fluoroscopy, ultrasound, and CT at Grady Memorial Hospital and Emory University Hospital Midtown. MSK radiologists collaborate with hospital physical medicine and rehabilitation (PM&R) physicians to review imaging studies and discuss approaches to care.

Emory Radiology's MSK and IR divisions are partners in the Emory Sarcoma Center of Winship Cancer Institute. Located at Emory University



Advanced practice providers (APPs) like **Jackie Knight, NP**, make collaboration easier. The nurse practitioner assists **J. David Prologo, MD**, the clinical site director for IR at Emory Johns Creek who is renowned for image-guided treatment of phantom limb pain, pudendal neuralgia, and cancer pain. Jackie coordinates with referring doctors to help Dr. Prologo and his patients prepare for treatment.

"It can overwhelm patients," Jackie says. "I get all the information necessary and schedule any pre- or post-procedure visits to ensure patients are ready on the day of treatment, but the most important part of my work is easing a patient's fears. I explain things in ways they can understand, and that really helps them feel they can trust us."

Hospital Midtown, the center is the largest in the Southeast. The MSK division also is a primary partner at the Emory Orthopaedics and Spine Center and the new Emory Sports Medicine Center, both at Executive Park.

EXCELLENCE IN SPORTS MEDICINE

On the second floor of the Sports Medicine Center, which opened in late 2017, two x-ray suites neighbor the Siemens Magnetom Skyra 3T MRI suite, where 3-D imaging of joints and the spine enables precise diagnosis of complex conditions. A new Carestream Cone Beam CT produces 3-D images of weight-bearing studies to pinpoint defects impairing upper or lower extremity mobility. The low-dose CT features walk-in entry for significantly injured patients.

The radiology reading room is in the orthopaedic physicians' work area and adjacent to patient exam rooms to facilitate a team approach to clinical decision-making and treatment.

Making the facility truly remarkable is how it combines diagnostic imaging and clinical treatment resources with a professional sports training center for the Atlanta Hawks NBA team. The Hawks Nest boasts two full-sized practice courts, athletic performance training areas, a film room, and a recovery area offering cryotherapy, sensory deprivation tanks, and in-ground hydrotherapy. The Hawks Basketball Operations Team also is onsite.

Emory Radiology's MSK team joins Emory's sports medicine team in providing diagnostic and treatment services in the facility for the Hawks, the Atlanta Dream WNBA team, the Atlanta Braves MLB team, the Atlanta Falcons NFL team, and Atlanta United MLS team. Weekend warriors, little sluggers, varsity stars, and daily pavement pounders now can go where the pros go and benefit from advances first pioneered to get elite athletes back in the game.

"We're democratizing excellence in performance and mobility," says **Felix Gonzalez, MD**.

IN HER SHOES

After ankle-repair surgery, Amy Kuhn was supposed to wear supportive shoes to prevent arthritis. A fibroma, a benign mass between the instep's skin and muscle, made arch supports uncomfortable.

"Even the slightest supports were difficult to wear for more than an hour, which made staying active and keeping up with my two kids difficult," Amy recalls. "It was like I had a rock pressing into my foot."

The orthopaedic surgeon referred her to Dr. Gonzalez, who used ultrasound imaging to guide steroid injections into the fibroma. Just two injections brought relief.

"They shrank the fibroma considerably," Amy says. "Thanks to Dr. Gonzalez, I now can maintain a more active lifestyle and even wear heels!"

Photo at right: Musculoskeletal radiologist Felix Gonzalez uses a model to note the location of a fibroma before treating a patient.

Learn more about Education online by scanning the QR code above using your favorite QR reader app.

Emory Radiology trains skilled and compassionate clinicians additionally experienced as educators, researchers, and leaders, says Vice Chair for Education **Mark E. Mullins, MD, PhD**. After an internship, training advances in four highly competitive residency programs: diagnostic radiology (**Christopher Ho, MD**, program director), interventional radiology (**R. Mitchell Ermentrout, MD**, interim program director and **Zachary Bercu, MD**, interim program co-director), and nuclear medicine (**David C. Brandon, MD**, program director). The Medical Physics Residency, presented in partnership with Phoenix Technology Corporation and Alliance Medical Physics and led by **Jonathon A. Nye, PhD**, combines diagnostic imaging and nuclear medicine training to qualify graduates for practice as medical physicists.

New fellowship programs in pediatric interventional radiology and imaging informatics join programs in abdominal, breast, cardiothoracic, emergency, musculoskeletal, and pediatric imaging; interventional neuroradiology; vascular interventional radiology; neuroradiology; nuclear radiology; and nuclear medicine PET in offering exceptional subspecialty training.

The Medical Imaging Program, led by **Theodore Brzinski, MES, RT(R)**, is only one of two baccalaureate programs in Georgia. It offers concentrations in radiology administration, radiography education, and advanced clinical practice with specialization in computed tomography, interventional radiology, magnetic resonance imaging, and women's health (mammography and bone densitometry).

2.1. MENTORING MEDICAL STUDENTS

Emory School of Medicine students begin studying radiology and image-guided medicine in second-year electives like Clinical Correlation: Anatomy, Pathology, and Radiology. Next is the required virtual, integrated third-year radiology clerkship run by **Stefan Tigges, MD**. In their fourth year, students may participate in a four-week radiology elective administered by **Eugene Berkowitz, MD, PhD**, plus the opportunity for a radiology-related research project during their fourth year.

Faculty enjoy helping students with career exploration. For neuroradiologist **Jason Allen, MD, PhD**, "Mentoring is one of the most important things we do with medical students. I get to know them, so I can help them find not just the specialty that interests them, but also the kind of training programs that best fit their goals and strengths."

For first-year resident **Sidd Kosaraju, MD**, "Dr. Allen showed a great deal of interest in making sure my Discovery experience was a productive one, and that I was able to present at conferences and get published. That he and several other faculty members were invested in making sure I had the best shot of going where I wanted for residency (whether that was Emory or not) seemed indicative of a very nurturing culture, and that's a big part of why I decided to stay."

Mentorship also happens through the Emory Radiology Interest Group (ERIG). **Judith Gadde, DO, MBA**, advises the group. In 2017, ERIG organized "Radiology into the Light: A Women's Symposium," which was well attended by medical students from Emory, Mercer, Morehouse, and Medical College of Georgia plus department faculty and alumnae. Faculty panelists shared their career paths and addressed issues such as work-life balance, academic versus private practice pathways, and mentorship.

For **Brianna Vey, MD**, involvement in ERIG—she co-organized the women's symposium—plus a radiology Discovery project and faculty mentoring helped her choose Emory for both her internship and diagnostic radiology residency.

2.2. DIVERSITY ENRICHES RESIDENCY PROGRAMS

Emory Radiology residents are as diverse as they are accomplished. Recruitment efforts include Diversity Interviewing Days, which highlight the ways Emory is an especially welcoming and diverse community of scholars. The days are popular and effective.

Emory's Interventional Radiology Integrated Residency program not only matched with its top candidates in 2017 and 2018; the two classes comprise 50% women and minorities.

"Programs, including ours, are small while interest is substantial. Top candidates are heavily recruited, so it's incredible to match with the best," says former director of IR **Gail Peters, MD**. "Our matched applicants are a truly diverse group of brilliant and accomplished individuals."

Similarly, more than 50% of the Diagnostic Radiology Residency program's 2017 and 2018 match classes are women and minorities.

"Diversity in all its forms matters to us. It is what makes us such a wonderful place for residents to train," says Dr. Ho.

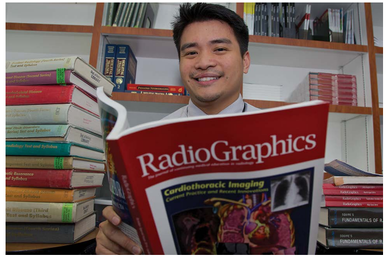
First-year resident **S. Rafael Arceo, MD**, agrees. He chose Emory both for its exceptional radiology training and its rating as a Top Performer in the Human Rights Campaign 2018 Healthcare Equality Index. The rating lauds Emory's foundational protection in practice and policies for patients, visitors, and employees of the LGBTQI community.

"It's important for me to feel protected as an employee and for the healthcare facility itself to share my values of practicing inclusivity and non-discrimination," he says. "Emory became my top pick after I met with faculty and residents and participated in a Diversity Day interview, where these values came to the forefront."

2.3. INTERVENTIONAL RADIOLOGY RESIDENCY PROGRAMS GROW

Emory Radiology is expanding interventional radiology (IR) training opportunities. The first

More than four years in the making, the IR Residency Program responds to the growing demand for and interest in image-guided medicine to treat an increasingly wide range of diseases and conditions. "Our program is different than most other IR residency programs," says Dr. Peters. "Our IR residents complete six months of clinical training, rather than only the one month stipulated in the program accreditation requirements."



Dr. Dexter Mendoza

four trainees in Emory's new Interventional Radiology Integrated Residency program arrived July 1st and four more begin in 2019. In 2018, Emory obtained ACGME accreditation for a two-year IR-Independent Residency with six slots for trainees who already completed a diagnostic radiology residency. Early Specialization in Interventional Radiology (ESIR) in the Diagnostic Radiology Residency program lets three fourth-year residents complete a specialized curriculum in preparation for advanced entry into the second year of the Independent IR Residency.

2.4. RESIDENT-LED INNOVATION

Emory Radiology encourages its residents to develop more than clinical skills. With funding and mentorship through the department's Adopt-A-Resident program, enterprising residents are creating program tracks to more formally prepare trainees for rewarding careers as educators, researchers, informatics specialists, and, most recently, medical entrepreneurs. The vision is for residents to be well-rounded professionals with a broad range of skills needed to achieve their career goals.

Dexter Mendoza, Clinician-Educator Track

Dexter Mendoza, MD, always enjoyed teaching. To prepare for an academic medical career, he thought residents like him needed a structured training program, so he proposed creating one and was awarded Adopt-A-Resident program funding to do just that.

Dr. Mendoza designed the resident Clinician-Educator Track curriculum to include seminars and group discussions about learning theories, learning and teaching styles, providing feedback, developing curricula, mentorship, and research. A required capstone project for the track has germinated additional innovation. For his capstone, Dr. Mendoza created a curriculum for building an academic career using teaching and education research. His work resulted in presentations at the Association of University Radiologists' (AUR) 2017 and 2018 conferences plus an article published in *Academic Radiology*. Resident **David Theriot, MD**, established a popular Friday morning resident teaching session this year for his capstone project.

Mentorship facilitates success. Dr. Mendoza credits Dr. Mullins plus Adopt-A-Resident mentors **Ryan Peterson, MD**, and **Meg Fleming, MD**, for his own success. He, in turn, mentored residents as they progressed through the track, thereby ensuring a leadership pipeline. Dr. Theriot assumed track leadership July 1, and **Fred Bertino, MD**, succeeds him in 2019.

Dr. Mendoza also inspired other residents to propose additional program tracks (see right), and he appreciates the opportunity to be both inspirational and inspired.

"I'm very grateful to Emory, not just for helping me realize my passion, but for the opportunity to turn my career exploration into a pathway for other residents interested in clinical education."

Patricia Balthazar, Informatics Track

Patricia Balthazar, MD, just began year three of residency, yet she already has 21 published journal articles and national awards like the AUR Trainee Prize, the ACR-AUR Research Scholar Award, the Radiology Alliance for Health Services Research - Harvey L. Neiman Award, and the Radiological Society of North America (RSNA) Roentgen Resident/Fellow Research Award. She's the founding member and chair of the Society for Imaging Informatics in Medicine (SIIM) Residents, Fellows, and Doctoral Students Committee, and she will become a chief resident for Emory Radiology in 2019.

She also created a new Integrated Imaging Informatics Track (I3T) as an Adopt-A-Resident project for Emory Radiology residents interested in careers that maximize the quality and efficiency of imaging informatics technology and services. The I3T curriculum, approved in the spring for rollout in fall 2018, includes didactic instruction plus an informatics capstone project. Dr. Balthazar has been working on an operational informatics project to improve resident workflow and feedback during call. She also studied a data retrieval tool to find and list imaging reports with noncritical, incidental findings to improve patient follow-up; a successful pilot-test was presented at the SIIM annual meeting.

Dr. Balthazar appreciates Emory Radiology's support. "The department has never said no to me. If you have a good project, you'll find mentors, appropriate resources, and protected time as needed to make it happen. It's an incredible opportunity at Emory to have faculty specifically interested in informatics to learn from and to be mentored by national leaders."

Alex Dabrowiecki, Medical Entrepreneurship Track

Adopt-A-Resident 2018 grantee **Alex Dabrowiecki, MD**, is designing a Radiology at Emory Medical Innovation (REMI) Track, which combines didactic education with hands-on learning so residents can turn good ideas into marketable products. Lectures covering theories and tenets of entrepreneurship and product development will be augmented by skills-building team challenges. REMI-track residents also will conceive and develop a prototype technological solution with an accompanying business plan as a capstone project. Mentoring and technical support will come from the biomedical engineering program at Emory and Georgia Tech as well as from Emory Radiology faculty and Emory's Office of Technology Transfer.

Dr. Dabrowiecki foresees, "This track will increase our confidence and proficiency in innovating solutions while also developing the leadership skills required for radiology and business."

Dr. Alex Dabrowiecki

Learn more about Research online by scanning the QR code above using your favorite QR reader app.

Team science is more than a catchphrase in the Department of Radiology & Imaging Sciences—it defines the Division of Research. Helmed by **Elizabeth Krupinski, PhD**, the division has six areas of inquiry:

- Molecular Imaging, Biomarker & Probe Development;
- Advanced Imaging Sciences;
- Computational Image Analysis & Guidance;
- Precision Imaging: Quantitative, Molecular & Image-Guided Technologies;
- Integrative Imaging Informatics; and
- Imaging Implementation Sciences.

Team science is essential for attracting funding, driving innovation, and propelling translational research to directly improve patient care. Collaboration occurs within and across teams, with other Emory departments, and even with other research institutions.

3.1. RECRUITING TEAM PLAYERS

In the past two years, Radiology hired junior faculty members with the expertise and acumen for groundbreaking team science. They are **Candace Fleischer, PhD**, biomedical spectroscopy and imaging; **Michal Horný, PhD**, healthcare policy and economics; **Marina Piccinelli, PhD**, bioengineering and diagnostic software development; **Amir Pourmorteza, PhD**, spectral and high-resolution CT biomedical engineering; and **David Reiter, PhD**, MRI biochemistry.

Radiology also added joint/adjunct faculty in the Biostatistics & Bioinformatics Shared Resource of Winship Cancer Institute at Emory, and Georgia Tech's School of Electrical & Computer Engineering and Institute for Robotics & Intelligent Machines. Collaborating with new leadership in Emory's departments of Biomedical Informatics and Biomedical Engineering, Radiology is actively pursuing joint faculty with cross-disciplinary talents and research interests in medical imaging.

3.2. CENTER FOR SYSTEMS IMAGING SUPPORTS RESEARCH COLLABORATION

The Center for Systems Imaging (CSI) provides state-of-the-art imaging services for Emory investigators and community partners. Led by **John N. Oshinski, PhD**, associate professor, CSI and Radiology and Imaging Sciences faculty have developed innovative imaging systems, biomarkers, and methods to support translational research. CSI also lends investigators its imaging technologists, scheduling coordinators, radiopharmacy experts, and post-doctoral fellows.

CSI provided imaging services to 52 investigators in FY 2018 with $12.96 million in direct costs plus $5.7 million in faculty time funded by grants. Department "super-users" whose researchers require hundreds of scans include psychiatry, internal medicine, and neurology.

For example, super-user **Ihab Hajjar, MD**, associate professor of medicine, neurology,

Photo at right: Dr. Deqiang Qiu

"Designing the MR imaging protocols, and then analyzing the images we've taken of close to 500 patients so far, is a powerful and proud contribution to research into early prediction and treatment of Alzheimer's disease."

Deqiang Qiu, PhD

and radiology is collaborating with Radiology's **Deqiang Qiu, PhD**, assistant professor and CSI's MRI program director, on three NIH-funded research studies: the VASCULAR study examining the relationship between peripheral vascular disease and cognitive function and two clinical trials testing a hypertension angiotensin receptor blocking drug to treat mild cognitive impairment.

"Designing the MR imaging protocols, and then analyzing the images we've taken of close to 500 patients so far, is a powerful and proud contribution to research into early prediction and treatment of Alzheimer's disease," says Dr. Qiu.

3.3. UNDERSTANDING GULF WAR ILLNESS

Up to 250,000 veterans of the 1991 Gulf War suffer from Gulf War Illness (GWI), a condition characterized by deficits in word-finding, memory, concentration, movement, and sensory perception; persistent mood disturbances; and chronic pain.

Radiology's **Kaundinya Gopinath, PhD**, assistant professor, is collaborating with **Bruce Crosson, PhD**, professor of neurology and radiology at Emory and the Atlanta Veterans Administration Medical Center, plus colleagues in internal medicine at the University of Texas Southwestern Medical Center and computer engineering at the University of Houston Clear-Lake to explain the baffling condition.

Brain function happens through communication between networks of brain regions. Dr. Gopinath's team imaged veterans with GWI and normal control subjects using resting state functional MRI, and then applied advanced network analysis. They found impairments in different brain function networks significantly corresponded to GWI symptoms. For example, networks of brain areas that process pain were overactive in GWI patients while communication between language processing areas was impaired.

"Using functional MRI, we're able to better understand mechanisms that underlie the symptoms of Gulf War Illness, which we hope can lead to new treatments," says Dr. Gopinath.

3.4. RESEARCH IN RESIDENCY: ANNA TROFIMOVA

As one of six residents in the Residency Research Track, **Anna Trofimova, MD, PhD**, merges her clinical diagnostic radiology training with training in imaging sciences to jumpstart her academic neuroradiology research career. The third-year resident already has 21 published journal articles, two book chapters, and 25 presentations at national and international conferences. Her study pioneering a five-minute brain MRI for children with headaches, which was guided by mentor **Nadja Kadom, MD**, earned the first-place scientific paper trainee award at the 2018 AUR conference.

Her capstone project, funded by a $30,000 RSNA research grant and undertaken in collaboration

Photo at right: Dr. Kaundinya Gopinath

"Using functional MRI, we're able to better understand mechanisms that underlie the neurological symptoms of Gulf War Illness, which we hope can lead to new treatments."

Kaundinya Gopinath, PhD

with Shepherd Center's Brain Injury Rehabilitation Program, investigates functional and structural brain connectivity alterations in patients with post-concussive central vestibular impairment. Using a novel paradigm with task-based and resting state functional MRI and diffusion tensor imaging, Dr. Trofimova hopes to advance understanding of the altered brain connectivity underlying persistent vestibular dysfunction post-injury, which could inform development of rehabilitation techniques.

"Being part of the Research Track supports continuous professional development as a researcher," she says. "Writing the RSNA grant was a novel experience for me. Working with my mentor, Dr. Jason Allen, as well as Dr. Krupinski, allowed me not only to get funding but also to learn about grantsmanship and create a knowledge base for future projects."

3.5. COLLABORATIVE NANOMEDICINE AND THERANOSTICS

For more than 15 years, Radiology's **Hui Mao, PhD**, professor, has been leading research in nanomedicine and molecular imaging to improve the detection and understanding of cancers and neurodegenerative and cardiovascular diseases. Team science aptly describes how post-doctoral fellows, doctoral students, and visiting faculty work in the lab of this Distinguished Investigator of the Academy of Radiology and Biomedical Imaging Research and Chair of the NIH Study Section for Clinical Molecular Imaging and Probe Development.

Team science also defines his longtime collaboration with **Lily Yang, MD, PhD**, professor of surgery and radiology, and Nancy Panoz Chair of Surgery in Cancer Research. They have pioneered molecular imaging probes and techniques using MRI, PET, and CT to detect and characterize cancers based on their biomarkers. They are developing biomarker-targeted MRI contrast agents and multimodal imaging probes to image cancer at the molecular and cellular levels. The results will inform their work developing novel nanomaterial and nanotechnology for medical applications, especially for image-guided delivery of therapeutic agents, or theranostics. Theranostics could transform cancer treatment once validated through translational clinical trials.

"The imaging strategies and approaches we are developing are about enabling precision medicine," says Dr. Mao. "The goals are to interrogate the diseases based on their biomarkers and then stratify patients for the appropriate treatment, which will be delivered through imaging guidance using nanomaterials and technology as platforms."

The duo has secured $15 million in NIH grants with top scores and has produced more than 80 high-impact publications for their work to date. Both Mao and Yang belong to the Emory 1% club—NIH grant awardees whose proposal received impact scores in the top 1% of all proposals evaluated by NIH review study sections.

Photo at right: Drs. Hui Mao and Lily Yang

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Photo at right: Back row from left: Peter Harri (f-faculty), Maaz Maqbool (t-trainee), Janice Newsome (f), Howard Fleishon (f), Marijn Brummer (s-staff), Adam Prater (f), Christopher Vant (s), Brenda Hall (s), Steve St. Louis (s), Denise Fennell (s). Front row from left: Mohammed Elsayed (t), Charlotte Chung (t), Paty Balthazar (t), Nabile Safdar (f), Dongqing Shi (s), Starla Longfellow (s), Mercy Mutahi (s), Trecia Wertz (s).

4.1. STANDARDIZING IMAGING REPORTS

New uniform reporting templates rolled out departmentwide in spring 2018, thanks to leadership from the vice chairs for Imaging Informatics (**Nabile Safdar, MD, MPH**); Health Policy and Practice (**Richard Duszak, Jr., MD**); Clinical Affairs (**Amit Saindane, MD**), and Quality (**Marta Heilbrun, MD, MSCI**).

Radiologists from all clinical divisions crafted templates for each kind of imaging study. The divisions of Emergency and Trauma Imaging, Neuroradiology, and Community Radiology Specialists collaboratively designed templates they all can use for common studies. Templates standardize both report structure—what goes where and in what order—and wording/terminology.

A governance committee of faculty from all divisions and locations continually solicits feedback from radiology colleagues and referring physicians and adjusts templates to meet evolving needs.

"The standardization improves clinical decision-making, billing accuracy, and workflow efficiency," says Dr. Safdar. "Each is a desirable outcome itself, but, really, they all maximize what's most important: the quality of patient care."

4.2. TAKING THE PATIENT PERSPECTIVE

When patients access their imaging reports via the Emory Patient Portal, timeliness and readability are key. Standardization improved readability for physicians, but more work was needed to meet national patient readability guidelines. Patient Family Advisory Council member **Karol Green**, a communications professional as well as a patient, jumped in to help.

"Karol was wonderful," says neuroradiologist **Nadja Kadom, MD**, associate professor and project leader. "She said radiology lingo scares patients. She helped us break it all down in simple terms."

Kadom's team first focused on conveying good news: the radiologist sees nothing to worry about. The next challenge was simplifying wording about study findings that need follow-up but are unrelated to the reason the patient came in for the imaging study. The words also had to explain recommended next steps, and those had to be rooted in evidence-based standards.

The work dovetails with ACR's national patient and family-centered care initiative and is partly funded by an ACR grant. The resulting templates pilot-tested well with patients and may provide best practice models for others.

"The standardization improves clinical decision-making, billing accuracy, and workflow efficiency… they all maximize what's most important: the quality of patient care."

Nabile Safdar, MD, MPH

Learn more about Partnerships online by scanning the QR code above using your favorite QR reader app.

Collaboration strengthens Emory Radiology's clinical care, enriches its educational activities, and powers its research enterprise. In addition to dozens of Emory University and Emory Healthcare departments, partners include Georgia Tech, Morehouse School of Medicine, Harvard University, Addis Ababa University, Children's Healthcare of Atlanta, Grady Memorial Hospital, numerous radiology-related professional associations, and even sports teams (see p.9).

5.1. NATIONAL IMAGING INFORMATICS CURRICULUM

Emory Radiology joins Penn's Perelman School of Medicine/Penn Medicine and Harvard Medical School/Brigham and Women's Hospital as the co-directing sites for the National Imaging Informatics Curriculum (NIIC), a week-long online program introducing learners to the fundamentals of imaging informatics with emphasis on practical knowledge.

The course combines lectures, facilitated group discussions, readings, and problem-solving exercises designed and led by the nation's leading informatics experts, including Emory Radiology's **Nabile Safdar, MD, MPH**, course co-director and co-architect. Participating Emory Radiology faculty are **Richard Duszak, Jr., MD**; **Falgun Chokshi, MD, MS**; and **Elizabeth Krupinski, PhD**, along with **Ashish Sharma, PhD**, from Emory Biomedical Informatics.

The registration fee for a US-based residency program covers an unlimited number of trainees, faculty, and informatics staff, and the program helps ACGME-accredited programs fulfill the informatics instruction requirement. The first two sessions held in October 2017 and January 2018 trained more than 600 residents, fellows, and new attendings from 60 programs, including Emory. The next sessions in October 2018 and January 2019 will reach more. NIIC is sponsored by the Radiological Society of North America and Society for Imaging Informatics in Medicine and funded in part by an Association of University Radiologists Strategic Alignment Award.

5.2. REPLēT RADIOLOGY ECONOMICS AND POLICY LEARNING ELECTRONIC TOOLKIT

Funded by an RSNA GE Healthcare/Education Scholar Grant (2017-19) to Vice Chair for Policy and Practice **Richard Duszak, Jr., MD**, the online electronic resource toolkit provides radiology trainees practical education in imaging economics and health policy. Content also satisfies the new curriculum requirements mandated for all 10 ACGME-accredited program types (e.g., diagnostic radiology residencies, interventional radiology fellowships). Practicing radiologists also may utilize the online learning modules for SA-CME credit—approximately two credits per course—required for ABR Maintenance of Certification.

Three dozen modules of approximately 20 minutes each are organized into five structured courses: Reimbursement Basics, Service Valuation and Costs, Current and Emerging Payment Models, Physician Performance Assessment, and Revenue Cycle Optimization. Two advanced modules are specialty-specific: nuclear radiology and vascular and interventional radiology. Each course includes case-oriented video mini-lectures, online self-assessment tests, and additional study resources. Signaling the importance of this project, RSNA is co-branding and hosting this series of courses on its online educational portal and making this initiative one of its priorities for trainee member communication and marketing over the next academic year.

5.3. PIONEERING DIRECT PATIENT CONSULTATION

It started five years ago in the Ear, Nose, and Throat clinic. Patients diagnosed with head and neck (H&N) cancers wanted to better understand the results of their scans so they could make informed decisions about their care. Emory Radiology's **Ashley H. Aiken, MD**, associate professor in the Division of Neuroradiology, and **Patricia Hudgins, MD**, professor and director of Head and Neck Radiology in the Division of Neuroradiology, started by collaborating with the treating ENT doctors on standardizing protocols so all of the H&N radiologists read and reported findings the same way. The resulting Neck Imaging Reporting and Data System (NI-RADS) is a best practice published in June 2016 in the *Journal of the American College of Radiology*.

Drs. Aiken and Hudgins then tapped Radiology's Patient Family Advisory Council (PFAC) for guidance on how radiologists could communicate directly with patients. For PFAC member **Jim Stapleton**, an H&N cancer patient himself, it had to start with the radiologist explaining her role so the patient could appreciate the expertise being offered.

They also talked with treating physicians and staff to ensure radiologists' involvement enhanced patient care. Drs. Aiken and Hudgins then created the patient consultation program for H&N cancer patients.

"There's something powerful about meeting with the expert who's interpreting the images of your anatomy," Mr. Stapleton says. "I could point to the image on the screen and directly ask the neuroradiologist my questions and get immediate answers."

Their work is showcased as a best practice in the ACR's Imaging 3.0 initiative. Emory Radiology's communications team co-produced the video component of the online materials.

Dr. Patricia Hudgins talks about Emory Radiology's patient consultation program for patients with cancers of the head and neck. The segment is part of a video developed collaboratively by the American College of Radiology and Emory Radiology for ACR's Imaging 3.0 initiative.

Learn more about Our People online by scanning the QR code above using your favorite QR reader app.

Photo at right: Clinical business manager Harold Glenn, Jr.

6.1. TECHNOLOGISTS REWARD EXCELLENCE

Friendly competition inspires Emory's radiography technologists to make every radiograph they take their best one yet. Each month, the best radiographs by rad techs across the Emory enterprise compete for the Merrill Award, a program created in 2012 and relaunched in 2017 by the Computed Radiography/Digital Radiography (CD/DR) Committee to celebrate excellence in radiography.

Merrill Award Committee members, themselves rad techs, use a two-part scoring system to select each month's winner. Monthly winners receive a $20 Amazon gift card and a feature in the department newsletter plus the chance to be named Merrill Award Winner of the Year and receive funding to attend the professional development workshop of their choice.

"It really means a lot to know your peers think you do award-winning work," says **Aurora Marinescu, RT(R)**, who chairs the selection committee and who has worked tirelessly with the entire committee to grow the program since 2017.

Nancy Stauffer, RT(R), a two-time winner who images at Emory Orthopaedics & Spine Center, agrees. "It means quite a lot since it is a peer award. I honestly was humbled and thrilled when I found out I had won."

Merrill Award Committee: **Aurora Marinescu** (chair) and **William Haralson** (vice-chair) – Emory University Hospital; **Michael Panas** – Emory University Hospital Midtown; **Veena Rajeevan** – Winship Cancer Institute; **Kelli Smith-Fore** – Emory University Orthopaedic and Spine Hospital; **Jason Smitherman** – Emory Orthopaedics and Spine Center at Executive Park; and **Wilber Pope** – Emory Saint Joseph's Hospital.

6.2. MOVING UP: MENTORSHIP MATTERS

The impeccably dressed, quietly commanding lead instructor for the Service Excellence Institute stunned two newly hired patient transporters by revealing his first job at Emory: patient transporter. In eight years—four with Emory Radiology—**Harold Glenn, Jr., MBA**, has become Emory Radiology's service excellence expert, responsible not only for SEI, but also the Patient Family Advisory Council, patient satisfaction surveys, and Caught in the Act of Service Excellence awards. That's in addition to his primary role as Emory Radiology's clinical business manager at Emory University Hospital Midtown.

The secret to his success? Service excellence, which is nurtured by mentoring.

"As a transporter, I talked to everyone, and I discovered that when others see you reaching out to people and being eager, they want to help you."

Mentors encouraged Harold to advance, from

"People see you differently as a transporter, but I still feel the same, even though I got my MBA and wear a suit."

Harold Glenn, Jr., MBA

call center representative to service ambassador. Another mentor connected Harold to Emory Radiology's **Deb Smith, MBA**, administrator for academic affairs, who Harold says "saw my potential and gave me opportunities to grow."

Harold credits both Smith and **Willie Arnold, Jr., MBA**, administrator for clinic operations, as major forces in his professional growth. "It wasn't about moving up, but rather about doing good work for a place that does good. They encourage me and everyone else around them to explore and maximize their potential."

Harold's now turning those insights into guidance for his colleagues, as well as for those who are looking up to him from where he started in 2009.

"I always appreciate the reaction I get when I say I started as a transporter. People see you differently as a transporter, but I still feel the same, even though I got my MBA and wear a suit. The values I learned there are the same that help me now: make things better wherever you are and take care of people."

6.3. DIVERSITY STRENGTHENS EMORY RADIOLOGY

Emory Radiology, like Emory University, embraces, understands, and celebrates the rich dimensions of diversity in its people. Each individual is unique and valued because of their differences across dimensions such as race, ethnicity, gender, sexual orientation, socioeconomic status, age, physical abilities, religious beliefs, political beliefs or other ideologies, global locations, and cultures.

The Emory Radiology Diversity and Inclusion Committee leverages broad representation from faculty, clinical and administrative staff, and trainees to ensure different ideas, perspectives, and values can be expressed and contributed to enrich the department's work.

In January 2018, the committee launched a new web-based Diversity and Inclusion Toolkit. The toolkit provides faculty, staff, and trainees a wealth of resources designed to ensure Emory Radiology is a welcoming and supportive environment for all people. It also explains the basic tenets of diversity, inclusion, and equity, and it provides concise definitions of other key terms such as unconscious bias, microaggression, and white privilege.

Work is underway to expand diversity training opportunities across the department in partnership with Emory University's Office of Equity and Inclusion.

Learn more about Awards and Recognition online by scanning this QR code using your favorite QR reader app.

FACULTY RECOGNITION

American College of Radiology Gold Merit Abstract

Meg Fleming, MD, MSc
Eric Friedberg, MD
J. David Prologo, MD, FSIR

American Journal of Roentgenology Silver Distinguished Reviewer Award

Elizabeth Krupinski, PhD, FSIIM, FSPIE, FATA, FAIMBE
Mark Mullins, MD, PhD, FACR
Srini Tridandapani, MD, PhD

Association of University Radiologists A³CR² Outstanding Teacher Award

Mark Mullins, MD, PhD

Association of University Radiologists Achievement Award

Mark Mullins, MD, PhD

Association of University Radiologists Gold Medal

Carolyn Meltzer, MD, FACR

Association of University Radiologists Radiology Research Alliance Innovation and Leadership Award

Jon Lewin, MD, FACR

Fellow, American College of Radiology

Mark Mullins, MD, PhD
David Schuster, MD, FACR
Stephen Simoneaux, MD, FACR

Fellow, American Institute for Medical and Biological Engineering

Elizabeth Krupinski, PhD

Fellow, Society of Interventional Radiology

Gail Peters, MD
J. David Prologo, MD

Radiological Society of North America Cum Laude Award

Fred Bertino, MD
Kiery Braithwaite, MD
Matt Hawkins, MD
Sarah Milla, MD, FAAP

Radiological Society of North America Honored Educator Award

Elizabeth Krupinski, PhD

Society of Interventional Radiologists Resident, Fellow and Student Case Competition Winner

Anne Gill, MD
Matt Hawkins, MD
Christopher Hesh, MD

Stanley Baum Outstanding Poster and Exhibit Award

Fred Bertino, MD

APPOINTMENTS

Trustee, American Board of Radiology

Stephen Simoneaux, MD

Vice Chair, Board of Trustees, American Board of Radiology

Mary Newell, MD

Vice Chair, Board of Chancellors, American College of Radiology

Howard Fleishon, MD, FACR, MMM

Board of Chancellors, American College of Radiology

Matt Hawkins, MD

Secretary/Treasurer, Executive Committee, American College of Radiology

Howard Fleishon, MD, MMM

Vice Speaker, American College of Radiology

Richard Duszak Jr., MD, FACR

Chair, Executive Council and Publications Committee, American Roentgen Ray Society

Deborah A. Baumgarten, MD, MPH

Chair, Gastrointestinal Education Exhibits Committee, Radiological Society of North America

Courtney Moreno, MD

Board of Directors, Society for Pediatric Interventional Radiology

Matt Hawkins, MD

Senior Member, Society of Photographic Instrumentation Engineers

Elizabeth Krupinski, PhD

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