BLAZING THE TRAIL

Working with community leaders, Mallinckrodt radiologists brought mobile mammography to the women of St. Louis

Above: Patients watch an educational video aboard one of the early mammography vans.
Just over one year old, Mallinckrodt’s chapter of RAD-AID is collaborating with international partners to identify needs, develop solutions to technical problems, conduct research, and share information.

Mallinckrodt recently installed a next-generation SPECT/CT system. The new CZT technology powers a detector that converts light into a digital signal, making it speedier and more efficient.

Renovation to several clinical areas in the Mallinckrodt Institute of Radiology building promises the latest technology, easier access, and ultimately, better care for MIR patients.

The first mammography van hit the road in August, 1986. In the intervening years, it’s undergone several innovations. The most recent model, debuted in March 2016, offers the latest breast imaging technology, including tomosynthesis (3D mammography). Please turn to page 8 to learn more about the evolution of this community outreach program.

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Why Mallinckrodt? Perspective from MIR’s director

Why Mallinckrodt Institute of Radiology (MIR) for your patients, for your residency, and for radiological research? MIR director and alumnus, Richard L. Wahl, MD, (Class of 1982) answers these questions in a new, four-minute video (mir.wustl.edu/about-us/department-chair-video) featured on MIR’s website. The video is part of an initiative to recruit residents and to better explain the benefits of Mallinckrodt to potential patients, clinicians, and researchers.

“I’m particularly enthused about the quality of services we offer at Mallinckrodt for patients,” says Wahl. “We have a rare marriage of basic radiological science and patient care, and we have worked hard to have subspecialized radiologists who are experts in specific body areas interpreting studies.”

Mallinckrodt is also one of the few radiology programs that has, on average, two conferences a day for residents, says Wahl. Consequently, MIR residents receive substantial didactic and case-based education with residencies in diagnostic radiology, diagnostic nuclear medicine, radiological research and integrated interventional radiology. Collectively, these programs represent a broad portfolio for individuals who want to learn diagnostic radiology or image-guided interventions.

Not only is MIR one of the top three training programs in the nation, says Wahl, it’s typically one of the top five institutions in terms of National Institutes of Health (NIH) support for research. “We encourage bench-to-bedside research, in which our radiological discoveries are rapidly moved to prospective research studies and, if the results are good, are integrated into clinical practice.”

Schwarz to head nuclear medicine society

Sally J. Schwarz, MS, RPh, BCNP, professor of radiology, is the new president of the Society of Nuclear Medicine and Molecular Imaging. She is the first pharmacist and only the fourth woman out of 60 presidents to hold the title.

Among Schwarz’s goals as president is to work with the Food and Drug Administration (FDA) to ensure that safe and effective pharmaceuticals are widely available. She also will focus on a program to cross-train nuclear pharmacists and radiochemists in aspects of each other’s fields so members of both groups can be qualified to approve the release of manufactured radiopharmaceuticals.

Schwarz’s research focuses on the regulatory issues involved in the use of radioactive compounds for diagnostic or therapeutic purposes. She is co-director of MIR’s Cyclotron Facility, which produces PET drugs for diagnostic purposes.

Above: Radiology technician Jim Naes talks with a patient in the video

Above: Sally J. Schwarz, MS, RPh, BCNP
2016 Distinguished Investigator Award

Robert J. Gropler, MD, and Sheng-Kwei (Victor) Song, PhD, were among 38 researchers nationwide honored with the 2016 Distinguished Investigator Award from the Academy of Radiology Research (AAR).

The Distinguished Investigator Award acknowledges and celebrates high levels of achievement in the field of academic imaging research. It especially encourages those who have achieved scientific excellence while still being involved in clinical care, but is not limited to clinician scientists only.

Gropler, professor of radiology, is a member of MIR’s Division of Nuclear Medicine. He has clinical interests in nuclear medicine, cardiovascular imaging, coronary artery disease, and PET imaging. He also serves as senior vice-chair and director of MIR’s Division of Radiological Sciences.

Song, professor of radiology, is a member of MIR’s Biomedical Magnetic Resonance Laboratory (BMRL). His primary research interest is the development of diffusion MRI-derived biomarkers of white matter injury and function.

The ARR was created in 1995 to raise awareness of the value of imaging research and its impact on patient care.

Lung cancer screening program launched

"In Missouri, lung cancer accounts for 17 percent of all cancers and 30 percent of all cancer deaths," says David S. Gierada, MD, professor of radiology. “Early detection can be lifesaving.”

Gierada made the comments during a mid-September luncheon at the official launch of the Siteman Cancer Center Lung Cancer Screening Program, a collaborative effort between Mallinckrodt Institute of Radiology, Barnes-Jewish Hospital, and Siteman Cancer Center. Gierada and his team lead the effort, and the new center has been designated as an American College of Radiology (ACR) Lung Cancer Screening Center.

The program uses low-dose, spiral computed tomography (CT) to screen annually for lung cancer in persons who meet specific eligibility criteria. They must be between 55 to 80 years of age, and must have smoked at least one pack of cigarettes per day for 30 years, or two packs per day for 15 years, or three packs per day for 10 years.

“Even if you quit smoking, you may still qualify,” says Gierada, but you must have quit in the past 15 years.

Patients are encouraged to talk with their doctor or staff at the program’s Patient Care Coordination Center to decide if the yearly lung cancer screening is right for them as there is potential for health risks in addition to potential life-saving benefits. Medicare currently covers the costs of the screening for eligible patients, as do many private insurance companies, although in some cases, patients may have to pay a portion of the costs.

For more information, contact the program’s Patient Care Coordination Center at 314-747-3046 or visit siteman.wustl.edu/lungcancerscreening.
The annual MIR Research Symposium was held earlier this year in Washington University School of Medicine’s Farrell Learning and Teaching Center. Carolyn Meltzer, MD, professor and chair of radiology and imaging sciences, associate dean of research, Emory School of Medicine, presented the keynote lecture, followed by MIR faculty Jie Zheng, PhD, and Mikhail Berezin, PhD. Following the lectures, there was a poster session in the atrium and hearth representing all divisions of Mallinckrodt Institute of Radiology. The focus was on research performed by junior faculty, postdocs and graduate students, although the work of senior researchers also was displayed. Approximately 65 posters were showcased at this year’s event.
MIR offers IR residency

Mallinckrodt Institute of Radiology is proud to be among the first programs in the country to offer a dedicated interventional radiology residency. The program — the Integrated IR Residency Pathway — matched its first two residents last year.

The American Board of Medical Specialties established interventional radiology (IR) as a unique specialty in medicine in 2012. Two years later, the Accreditation Council for Graduate Medical Education (ACGME) approved a dedicated IR residency. The specialty comprises unique expertise in diagnostic imaging, image-guided procedures, and patient care. Graduates will be board-certified in diagnostic radiology and interventional radiology.

"While our home will always be in the Department of Radiology," says Gretchen M. Foltz, MD, assistant professor of radiology and director of the IR residency program, "the transition to an IR residency program will improve the clinical IR training for our residents."

The MIR Integrated IR Residency consists of five years following a clinical internship year and provides training in diagnostic (three years) and interventional (two years) radiology. Candidates match into the residency from medical school; two applicants are accepted into the program each year.

Residents rotate through three hospitals during their training — Barnes-Jewish Hospital, St. Louis Children’s Hospital, and Barnes-Jewish West County Hospital — and are assured comprehensive exposure to the full scope of diagnostic and interventional radiology. During the first three years of radiology training, IR residents build their diagnostic radiology foundation, rotating through the various diagnostic modalities and taking call with the diagnostic radiology residents. The final two years are mainly focused on image-guided interventions and invasive diagnostic procedures with additional rotations through the intensive care unit and IR-related areas. Myriad research opportunities, an active IR outpatient clinic, and busy inpatient admitting and consultation services complete the experience.

MIR is in the process of applying for four residency positions in an Independent Interventional Radiology Residency. The planned training experience, which will be available in 2020–21, will largely mirror the final two years of the Integrated IR Residency program. Eligible candidates will be individuals who have completed a four-year diagnostic radiology residency with consideration given both to applicants who have completed an ESIR (Early Specialization in Interventional Radiology) year, and those who have not.

Combined training track

Mallinckrodt is offering a new Combined Diagnostic Radiology/Nuclear Medicine Residency Track. Two residents will be accepted from the diagnostic radiology residency class for this specialized training track that enables graduates to obtain dual certification in diagnostic radiology and nuclear medicine.

A four-year training option allows 16 months of training in nuclear medicine during a four-year diagnostic radiology residency. This pathway is most suited for individuals who are interested in practicing clinical nuclear medicine.

The five-year training option provides up to 28 months of training in nuclear medicine by completing a standard four-year diagnostic radiology residency with the Year 4 training focused on nuclear medicine followed by a one-year nuclear medicine residency/fellowship. Some of the time spent in nuclear medicine would be devoted to research in the field. This pathway is most suited for individuals interested in practicing academic nuclear medicine.

NM Chief Resident 2016-17

Right: Jane Cunningham
BLAZING THE TRAIL
Mallinckrodt radiologists laid the foundation for quality screening mammography — in both fixed and mobile facilities — not just in St. Louis, but nationwide.

Patients entering the latest version of the Siteman Cancer Center mammography van might not notice the pink cursive lettering on the vehicle’s side panel. The message — Where You Go Matters — is more than mere decoration. Those four words encapsulate an unrivaled depth of experience and expertise that come from being the oldest continually operating mobile mammography program in the country — a program that sprang out of Mallinckrodt Institute of Radiology three decades ago.

The year was 1986. Two young MIR academic radiologists — Barbara S. Monsees, MD, and Judy M. Destouet, MD — saw a tremendous gap between the medical literature and clinical practice regarding mammography. “The American Cancer Society had recommended screening mammography as a routine part of a cancer checkup,” says Monsees, professor of radiology and emeritus chief of MIR’s breast imaging section. “But no one was getting one. There was no billing code for it and no program for screening. There was a disconnect between what was recommended and what was happening.”

The pair approached Ronald G. Evens, MD, then-director of Mallinckrodt, with the idea of building a screening mammography program, which included offering the service at the hospital radiology department and launching a mobile mammography unit. “It was exciting,” Evens recalls. “Here was something that was not only potentially powerful, but also scientifically valid. But the question was: How do we get women to do this?” And, Monsees says, “How do we get physicians to recommend this to their patients?”

Left: The latest mammography van, unveiled in March 2016
These were among the many questions to resolve as the physicians built a program from scratch. Since there were no purpose-built mammography vans at the time, they retrofitted an Airstream recreational vehicle — the iconic silver bullet-shaped camper — for their needs. “The mammo room was in the back, which was curved,” Monsees says. “The tech had to duck to do her work.”

This was still in the film days; they decided to process images in a tiny darkroom onboard. “That enabled our techs to do two things,” Monsees says. “If there was a problem with positioning, the tech could look at the image and repeat it right then. We didn’t want to have to recall the patient for that purpose. The immediate feedback also enabled the techs to improve; they’d know what an image looked like right away.”

Evens used his business acumen and community contacts to establish a business plan and network of screening locations. “One of the most important developments was our partnerships with Schnucks Markets and Boatmen’s Bank,” he says. “They not only supported the project monetarily but, more critically, they allowed their numerous sites to be used on a regular basis for screenings. Both companies paid for their own employees to get mammograms and promoted the van’s visits to the public.”

To further increase awareness, Monsees and Destouet gave numerous talks to women’s groups, at health fairs, and at corporate health events. They also participated in grand rounds and gave CME talks for physicians talking about the epidemiology of breast cancer and the rationale for screening. Since many insurers didn’t yet cover mammograms, they set the fee at a reasonable $50. They provided free screenings for women in need. In order to break even, they had to schedule 37 patients a day. Any fears about their ability to hit that number were allayed on the first day in service. As it arrived at its first stop, the van was greeted by a long line of women waiting to be screened.

The program set many precedents that became standard practice across the medical field. “From the beginning, we allowed women to order their own mammograms,” Monsees says. “We also issued reports directly to the patients. Not all primary care physicians were convinced this was a good thing. We were ahead of our time in using a computer system to generate reports and track outcomes. We also were one of the first programs to be accredited through the American College of Radiology (ACR) when that program was later developed. We strongly believed that our quality in
This page, clockwise:
Ron Evens, MD, celebrating the launch of the first mammography van:
Barbara Monsees, MD, on the first van:
mammogram machine, circa 1986
“We are women serving women,” says Chera Dunn, manager of the Joanne F. Knight Breast Health Center at Barnes-Jewish Hospital and Washington University School of Medicine’s Center for Advanced Medicine. “We travel from the smallest free clinic to the largest corporation. All of the women we serve are very appreciative.”

Evens worked with the ACR to implore Medicare to pay for screening mammograms. He was present when President Bill Clinton signed the bill into law in 1997. Thanks to the increase in coverage and awareness, the van saw a steady growth in the number of patients, hitting a peak of nearly 8,000 per year. For several years it ventured south of St. Louis on annual trips to the Missouri Bootheel, a rural area in the southeastern lowlands of the state where there were no other mammography providers.

These days, the van — owned by Barnes-Jewish Hospital and branded as Siteman Mammogram, with an MIR logo — divides its time in the St. Louis metro area among three types of visits: corporate (Nestle Purina), community (Schnucks, Shop & Save), and outreach (community clinics). The van is staffed by two people: a registrar and a technician who doubles as the driver.

“In 2006, it switched from film to digital mammography. The newest van — unveiled in March 2016 — offers breast tomosynthesis, also known as 3D mammography.”

Throughout its four incarnations, the van always has offered the latest in screening technology. In 2006, it switched from film to digital mammography. The newest van — unveiled in March 2016 — offers breast tomosynthesis, also known as 3D mammography.

“It was a beta test site for the technology before FDA approval, and now we’re offering it on the van as well,” says Catherine M. Appleton, MD, associate
professor of radiology and chief of breast imaging at MIR. “That’s important; tomography has been shown to both reduce false alarms that can be associated with screening and to improve cancer detection.”

When the van returns home at day’s end, the tomosynthesis images are transferred by data drop to the servers at Barnes-Jewish Hospital. “They’re read by our Washington University Mallinckrodt radiologists,” Dunn says, “just like Mallinckrodt alumni might have done in their days here.”

Indeed, Dunn and Appleton are mindful of the foundation laid by Monsees and others who came before them. “The legacy left by Barbara — of outreach, of the best technology, of world-class breast imagers — continues on,” Appleton says. “As we move forward, we’re excited about what the future holds.”

Since the first mammography van rolled out in 1986, an average of 7,500 women have been screened annually.

In 2015, corporate sponsors made it possible for 1,287 women to be screened at 35 sites throughout the St. Louis area.

Pink van unveiling in 2006

Siteman Cancer Center/MIR mammography van ribbon cutting, 2016

STAFFING THE CARE-A-VAN

Terri Coffman may be one of the few people in the country with both a mammography certification and a commercial driver’s license. She uses both in her dual role as driver and radiologic technologist for the Siteman Mammogram van.

“It has been a great experience working on the mammography van,” says Coffman, who has been with the program since its inception in 1986. “We often see the same women from year to year. I feel like these patients are my friends because I’ve been seeing them for so long. I get hugs all the time!”

She laughs when remembering the tight quarters of the program’s first Airstream van.

“All three of us working the van were pregnant at the same time, so we were always bumping bellies,” she says. Today, tight corners and parking spots are bigger concerns as she navigates the spacious new 40-foot-long vehicle around the St. Louis area.

After 30 years, Coffman still enjoys the variety of patients and places that come with being on the road. “I’ve definitely gotten to know my city well,” she says, “and I love what I do. I am so proud of this service that we bring to so many women.”
WORLDWIDE EXPOSURE

MIR residents broaden their focus to blend global health and radiology

by Kristin Baird Rattini

According to the World Health Organization (WHO), approximately 4 billion people in the developing world are at risk for widespread losses and deaths that can be avoided or treated if radiology were available.

Over the past year, a small team of enthusiastic radiology residents, a sonographer, and their mentors at Mallinckrodt Institute of Radiology (MIR) have blazed a trail in the global health direction by forming a chapter of RAD-AID International, a nonprofit radiology organization, and establishing a partnership with INCAN oncology center in Guatemala.

For Lauren Saling, MD, a fourth-year resident at MIR, the idea to launch the RAD-AID chapter was sparked in large part by global health field work she’d done in Ghana during her undergraduate biology studies at the University of Pennsylvania and field work in Peru and Honduras during her studies at Washington University School of Medicine (WUSM).

“It was wonderful that WUSM supported those global health initiatives,” she says. “There were a lot of opportunities. You gain a lot more from those trips than you’re able to give. They introduced me to not just global health, but the concept of being a global citizen.”

A The diagnostic CT scanner at ICAN
B Intensive care unit at ICAN
C Facade of ICAN (Instituto de Cancerologia), the only cancer referral hospital in Guatemala
D Ultrasound technologist Cindi Zurliene and MIR resident Lauren Saling look at ultrasound images in the ultrasound suite at INCAN
E Drs. Eduardo Gharzouzi, Lauren Saling, Kathryn Robinson, Joaquin Barnoya and technologist Cindi Zurliene in front of INCAN hospital (left to right)
F A technologist at Hospital Herrera Llerandi shows images from a coronary CT angiogram

Images courtesy of Lauren Saling, MD
IDEAL TIMING

Such opportunities have been drastically fewer and farther between for radiology residents. Imaging efforts make up a small percentage of the 6,000 short-term health-care missions in resource-poor settings that are sponsored to the tune of $250 million by U.S. organizations and institutions. “It’s easier for a clinical, medical, or infectious disease doctor to go to a developing place and help,” Saling says. “But radiology requires significantly more infrastructure and technology.”

A half-dozen organizations have stepped in to try to fill the void, with RAD-AID International being the most prominent. Founded in 2008 at Johns Hopkins University, RAD-AID has a mission to improve and optimize access to medical imaging and radiology in poor and developing regions of the world for increasing radiology’s contribution to global public health initiatives and patient care. RAD-AID counts 5,000 volunteers from 100 countries and 50 university-based chapters. It oversees on-site programs in 20 countries and hosts an annual conference on global health radiology.

Richard Wahl, MD, director of Mallinckrodt, was the person responsible for pointing Saling in RAD-AID’s direction. He knew the organization and its founder, Daniel Mollura, MD, well from his previous position at Johns Hopkins University as Mollura’s training director. The growth of RAD-AID is part of a confluence of trends that is expanding the role of radiology in global health, says Kathryn Robinson, MD, assistant professor of radiology and faculty advisor for the RAD-AID chapter. “The time is right for us to get involved in global health,” she says. She speaks from experience; like Saling, she, too, has participated in global health initiatives — in Eritrea, during medical school, and Ethiopia, with an interdisciplinary team of Washington University physicians.

“Advances in technology — such as portable ultrasound, cell phone data transfer, and increased internet access — have diminished the geographic barriers that previously existed for radiologists to get involved in global health endeavors,” Robinson explains.

Recent changes in the American Board of Radiology (ABR) core examination schedule now permit international elective, selective rotations in the PGY-5 year. In fall 2014, the Accreditation Council for Graduate Medical Education (ACGME) issued guidelines for international radiology rotations.

That new window of opportunity dovetails with resident interest. Robinson points to a survey published in Academic Radiology that showed 30 percent of radiology residents had participated in prior work in the developing world and 60 percent would do so again.

Lastly, the existence of well-established international exchanges across multiple disciplines on the Danforth Campus and at the Washington University School of Medicine greatly influenced where the RAD-AID chapter established its first partnership: with INCAN (Instituto de Cancerologia), the only cancer referral hospital in Guatemala.

“We didn’t need to reinvent the wheel,” Robinson says. “We could partner with colleagues from Washington University — in medical, global health, engineering — already on the ground in Guatemala City, learn from their experience, and share resources with them.”

RALLYING RESOURCES

Resources are at the heart of any global health initiative. Before visiting INCAN in May, Saling, sonographer Cindi Zurliene, and Robinson began evaluating INCAN’s resources using RAD-AID’s Radiological Readiness Assessment (RRA). The 81-page assessment scrutinizes everything from staffing levels, to the availability of complementary services (lab testing, biopsy surgery), to local infrastructure (roads, power grid, telecommunications). “The special needs and challenges of each country’s health care system means that each solution is different,” Robinson says.

The May visit to INCAN in Guatemala City provided an unblinking look at the public clinic’s challenges.

INCAN’s sole CT scanner is a 2-slice axial CT scanner that was not intended to be used as diagnostic machine. They have only two ultrasound machines; tape holds together one of the probes. They have no way to store digital images; they have to print images and make a handwritten report. “If the radiologist wants to see a scan in real time, he or she must perform the scan themselves,” Saling says.

Because there’s no Radiology Information System (RIS), radiologists keep a cardboard box next to their desks, filled with films from the past two to three weeks, arranged in chronological order, awaiting review. Monitor resolution is too low for reading mammograms.
Because Guatemalan public hospitals pay so poorly, physicians work at INCAN only in the morning and work in private practice in the afternoon. “They’re essentially donating their morning time,” Saling says. “It reminded me that we’re all focused on the same goal of doing what is best for the underserved.”

The visit crystallized for Saling, Zurliene, and Robinson how Mallinckrodt’s RAD-AID chapter could best help INCAN help its underserved patients. During a return trip in November, Saling will oversee the installation of a PACS. “They already use eFilm, which is helpful,” she explains. “We’ll also provide them cloud-based DICOM service, so they don’t have to deal with the infrastructure of an on-site server. It will enable them to compare prior images, which is crucial in oncology.”

**GIVING AND GAINING**

During her return trip, Saling and fellow resident Tyler Fraum, MD, also will undertake a research project on hepatocellular carcinoma (HCC). In the United States, HCC is usually diagnosed with a CT or MRI — technology not available at INCAN. So they’ll study the alternative diagnostic methods used by INCAN’s staff. “Resource-poor settings have to be able to make diagnoses with far less technology than we do,” Saling says. “Perhaps we can learn from them to improve our diagnostic skills.”

The pair also will spend time at Roosevelt Hospital, a nearby public hospital with 17 radiology residents — but no MRI or functioning CT scanner. The residents must bring their own laptops and complete a lot of independent study to make up for the lack of resources.

“As MIR residents, we work in an environment with widespread access to cutting-edge imaging technologies and ample exposure to rare diagnoses. As a result, we tend to take for granted how privileged we are to be part of this incredible residency program,” Fraum says. “For me, getting involved in RAD-AID seemed like a way to put my training in perspective and gain an appreciation of all the challenges radiologists in developing countries face on a daily basis.”

After the November trip, Saling will fly directly from Guatemala to RAD-AID’s national conference in Washington, DC, where she’ll present the results of the INCAN RRA. “Lauren has done a tremendous job in advancing the cause,” Robinson says.

Next year, when she departs MIR for an abdominal fellowship at UCLA, Saling hopes to find new global health opportunities there — while Robinson works with other globally minded residents back at MIR to build on the foundation laid so far by the RAD-AID chapter. “With four billion people with no radiology access, we need a paradigm shift,” Robinson says. “Radiology is integrally involved in every aspect of medical care. We have the expertise; we have to play an important role in addressing these disparities that exist around the world.”

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_Counter-clockwise: Kathryn Robinson, MD, left, and Lauren Saling, MD, in the reading room; the radiograph unit at INCAN; a waiting room at INCAN._
AN EVOLUTIONARY ADVANCE IN NUCLEAR MEDICINE
For six decades, nuclear medicine specialists at Mallinckrodt Institute of Radiology (MIR) and elsewhere have relied on gamma cameras that depended on sodium iodide crystals as the detector for the radiation coming from the radioactive tracers used for most imaging studies — including single-photon emission computed tomography (SPECT). In May 2016, that changed at MIR.

A delegation from GE Healthcare — as well as GE CEO Jeffrey Immelt — traveled to Mallinckrodt for the U.S. product launch of the Discovery NM/CT 670 CZT, its next-generation SPECT/CT system. The hybrid imaging method combines nuclear medicine identification from radioactive isotope tracers with X-ray images. The new detector technology, cadmium zinc telluride — most commonly referred to as CZT — is a semiconductor.

CZT technology powers a novel digital detector that enables conversion of photons (light packets) into a digital signal, making the technology speedier and more efficient. Until recently, CZT technology had been constrained to organ-dedicated devices used for imaging the heart and the breast. The new system is the first CZT-based scanner that allows doctors to perform exams on every organ as well as whole-body examinations.

Mallinckrodt was the second place in the world to install the new technology and is the only facility in the Americas to have it currently.

"Discovery NM/CT CZT marks an important evolutionary advance in nuclear medicine," says Barry A. Siegel, MD, professor of radiology and of medicine, senior vice-chair and director of MIR’s Division of Nuclear Medicine. "We are expecting improved energy resolution and image resolution and better statistical quality, which means we can get SPECT/CT images to be more precisely quantitative rather than just qualitative.”

Left: GE CEO Jeffrey Immelt (sixth from right), Barry Siegel, MD, and Richard Wahl, MD (white coats), were among the group that toured the SPECT/CT suite in May
“Think about TVs when they used to be CRTs (cathode ray tubes),” says Dmitry Beyder, Siegel’s colleague and Barnes-Jewish Hospital supervisor of nuclear medicine. “You had a big box; you could see sports and movies in color, though it was rather dull. This upgrade from analog nuclear medicine gamma cameras to a CZT digital gamma camera is like going from a CRT TV screen to a plasma TV. The size of the camera is smaller, and the image details are sharper.”

According to Siegel, the new technology will be a boon for both patients and MIR’s nuclear medicine practice. The smaller camera is less intimidating to patients, and CZT’s upgrade in spatial and contrast resolution will help in the detection of smaller lesions and their more accurate quantification.

Mallinckrodt was the second place in the world to install the new technology and is the only facility in the Americas to have it currently.

“We also are looking into reducing the scan time, lowering tracer dose, or both,” he says.

Doing two scans at once helps lessen the patient time in the radiation donut hole, but less time and lower dose also are results of CZT’s prowess.

First commercially available with conventional sodium iodide detectors in 1999, the hybrid SPECT/CT procedure fuses images together from two different scanning modes to provide more definitive information on many different organs and body parts. This yields information physicians can use to identify a variety of medical issues, including heart problems, cancerous lesions, and brain abnormalities indicative of Parkinson’s disease or seizures.

In SPECT, patients are injected with a specific radioactive tracer that localizes in certain body parts or organs, and the nuclear medicine gamma camera detects these concentrations. The camera rotates in a circle around the patient, which renders a reconstructed image in three dimensions.

In CT (computed tomography), the X-ray source similarly rotates in a circle, also to allow 3-D images. The X-rays are converted into a series of black-and-white images, each of which represents a thin “slice” of the anatomy. The 3-D SPECT and CT images can be viewed separately or as combined “hybrid images.

“CT gives you two different things: attenuation correction and anatomical localization, says Beyder. “You don’t have that with traditional SPECT.”

“When we see a ‘hot spot’ on a SPECT image and we don’t know exactly where it is, we can superimpose the CT image with the nuclear medicine image and see, for example, ‘Yes, that’s in the gall bladder,’ or ‘No, that’s in the upper pole of the kidney,’” says Siegel. CT also corrects for attenuation, which is a reduction in the signal intensity from photons having to pass through surrounding tissues.

Until 2015, the Division of Nuclear Medicine had one SPECT/CT scanner, located on the North Campus. That year the division installed four additional SPECT/CT scanners — two on South Campus, one on North Campus, and one at St. Louis Children’s Hospital.

Sodium iodide served as the detector in traditional SPECT/CT systems (it still does in most such systems). As a gamma ray photon comes out of the patient, it passes through the holes of a piece of lead called a collimator, then finds its way to a big, flat crystal of sodium iodide. The gamma ray interacts with the sodium iodide, which converts some of the energy that it absorbs into visible light, and that visible light is collected in an array of photomultiplier tubes, which in turn convert it into an electronic signal. These electronic signals are assembled by the camera into the nuclear medicine image.

With CZT — a much smaller gamma camera that operates digitally — when a gamma ray hits one of the elements of the CZT detector, it frees up some electrons and those electrons are directly collected and subsequently amplified into an electronic signal used for image creation.

"Whereas sodium iodide detectors have this intermediate light step where light gets converted in the photomultiplier tubes, with CZT it’s the interaction of the gamma ray with the detector and you immediately get the electronic signal,” Siegel says. “GE calls this ‘direct conversion.’

It’s one of the reasons CZT is much faster than sodium iodide detectors.

“Because of the direct conversion, the signal-to-noise ratio is much better,” he says. “And a bigger signal is associated with better energy resolution, which allows us to make sure we’re accepting only good photons coming from the patient.”
Siegel and Beyder now are collaborating with GE researchers to figure out how to do multi-energy imaging. One possible application of this is in the diagnostic evaluation of children with neuroblastoma, a rare childhood cancer. Children need both a bone scan, which uses the isotope technetium-99m as the tracer, and a scan with MIBG that uses an iodine-123 tracer. Because the CZT camera is digital and the energy resolution is much greater than that of a conventional camera, the researchers are attempting to determine whether they can perform both of these scans at the same time.

“The advantage is obvious,” Siegel says. “The young children undergoing these studies usually require general sedation. From a safety and expense standpoint, doing the exams together — with a single sedation — would be a plus.”

“This technology has the potential of doing amazing things,” adds Beyder. “If we can successfully do multi-energy imaging and quantify it, it may change the face of nuclear medicine.”

**Below:** Barry Siegel, MD  **Right:** Dmitry Beyder
MIR TOWER RENOVATIONS

Ultrasound, 1st floor

IR, 4th floor
MICHELE SEMIN, MD, is director of mammography and in-town account medical director for Advanced Medical Imaging in Lincoln, Nebraska. She has always been single-minded in pursuing her passions, be they attending Mallinckrodt Institute of Radiology or seizing every opportunity to travel and take photographs around the world.

Which faculty at Mallinckrodt made the greatest impression upon you?

There were so many wonderful role models. As the director of mammography for our outpatient center, I use the skills that Barb Monsees taught me every day. I learned how to deal with patients, organize our department more efficiently, and make our center a place where women want to come to have their imaging.

Claire Anderson was a mentor of mine through medical school and residency. Marilyn Siegel always had so much energy. She was such a leader in the field and a pleasure to work with.

Bill Middleton was head of ultrasound. His program was unique because we had to learn how to scan patients when we were on call. I still use those skills today to confirm findings and in training new ultrasound technologists.

I am also inspired by some of the residents I had the pleasure to help train during my fellowship. Some of them are still incredible friends of mine, such as Sanjeev Bhalla, Sean Pierce, and Cooky Menias. I look up to them as leaders in the field.

What attracted you to radiology?

A radiologist came to my physics class my junior year of high school and showed us MRIs, which were pretty new at the time. I was blown away. At that point I became focused on being a radiologist. It’s interesting because I ended up working in the same group as the radiologist who spoke to my physics class. So it came full circle.

Why did you choose Mallinckrodt for your residency training?

I was still in high school when I became aware that Mallinckrodt was one of the best, if not the best, radiology programs in the world. When I interviewed at Washington University for college, I even requested to visit the radiology department. So I knew right then that was where I wanted to train. Since I attended Washington University School of Medicine, I had the opportunity to do a couple of rotations at Mallinckrodt as well.

Please tell us about your position at Advanced Medical Imaging.

Our practice is unusual. We cover a large portion of Nebraska — about 22 rural hospitals and one of the main hospitals in Lincoln. We have two outpatient centers. It requires us when we are on call to be diverse in what we do. Even though I’m in charge of mammography, I do a bit of everything. My focus is women’s imaging, but I also use what I’ve learned to help set up ultrasound protocols.

As for my day-to-day, I am always in a different spot. Some days I am at the main hospital in town. Another day I’m at the outpatient center. Another day I’ll be on the road driving to a small town to do procedures. It’s lovely to get out and get to see the sky.
You have several passions you pursue outside of work. Please tell us about your love of travel and what other interests that has opened up for you.

When I was growing up in rural Nebraska, I always wanted to travel but didn’t have the means. I’ve now been to all seven continents and at least 30 countries. I love seeing the world and all its natural beauty, ancient ruins, and wild animals.

I’ve also developed a real passion for photography. I noticed that’s true for a lot of us radiologists. It’s a natural progression: We are imagers and visual people.

I have two rescue dogs. One I rescued on the streets of New Delhi seven years ago, from street kids who were torturing her. I named her Lakshmi, for the Hindu goddess of good fortune. My other rescue dog is named Parker Posey.

I also enjoy Broadway shows. I invested in Memphis: The Musical in London’s West End. It was nominated for several Olivier Awards, the British equivalent of the Tony Awards. I was fortunate to attend the Olivier ceremony.

For the past four years I also have participated in something called GISHWHES, the Greatest International Scavenger Hunt the World Has Ever Seen. It inspires creativity by getting people out of their comfort zones to do crazy things while spreading kindness. But there’s also a community service aspect, and the entry fee goes to the charitable foundation www.randomacts.org. Through GISHWHES, I’ve jumped out of an airplane dressed as one of the GISHWHES mascots, made a dress out of corn husks, asked people for hugs while traveling in Moscow, organized a party for nursing home residents, volunteered at a local soup kitchen, and helped raise more than $200,000 to help five Syrian refugee families. My team this year placed in the top 15 of more than 1,000 teams.

GISHWHES changes the way you look at the world; you realize that people are the same everywhere and that we all can use support and kindness. It has helped me in my practice because I recognize how just a smile or touch of the hand can make a huge difference to someone who needs encouragement.

Right: Semin enjoys parachute jumping and a stop in Moscow’s Red Square with her mother, Carolyn
Morvarid Karimi, MD, assistant professor of neurology and member of MIR’s Neuroimaging Laboratory (NIL), died on May 21, 2016. Just 44 years old, Karimi suffered a ruptured brain aneurysm while at work. Following emergency surgery, she was recovering when she experienced another unexpected major brain hemorrhage that she did not survive. Karimi was known for her strong sense of fairness and desire for everyone to be treated appropriately and equally. She was a champion for the rights of women in our society, especially in the workplace. She will be greatly missed by colleagues, who describe her as a “force” — tenacious, committed, and incredibly good and protective with her patients. On September 24, Karimi’s birthday, a small group of friends and family walked and gathered in Forest Park (group photo on page 1) to honor her. They hope to make it an annual event.

Retired MIR photographer Thomas Murry died August 8, 2016, in his hometown of Crystal City MO. He was 69. A U.S. Air Force veteran, Murry joined MIR as a medical photographer in 1974 after serving in Thailand during the Vietnam War. He continued in that role until his retirement from MIR in 2007.

Alexander Sukstansky, PhD, associate professor of radiology, presented “Generalized Lorentzian Tensor Approach” at the Quantitative Susceptibility Mapping workshop in Graz, Austria, on September 25-28, 2016.

Suresh Vedantham, MD, professor of radiology, gave the 27th Annual Conrad Jobst Lecture at the University of Michigan, “Advancing Venous Care – New Ways for a New World” on October 14, 2016.

Dmitriy A. Yablonskiy, PhD, professor of radiology, presented "Imaging of Tissue Oxygenation Using MIR" at the International Society for Magnetic Resonance in Medicine (ISMRM) annual meeting in Singapore on May 7-13, 2016.

Monica Shokeen, PhD, MBA, assistant professor of radiology and biomedical engineering, gave a course lecture (distance learning) titled “Copper-64 Labelled Peptides and Antibodies” at the Institute of Molecular Medicine-Center for Molecular Imaging at the University of Texas Health Science Center-Houston on September 26, 2016. She also presented “High Risk Disease” at the Myeloma Crowd Round Tables on High Risk Disease in St. Louis on June 18, 2016.


Sanjeev Bhalla, MD, professor of radiology, was appointed to the Board of Trustees of the American Board of Radiology (ABR). Bhalla has been volunteering for the ABR since 2005, starting with the Oral Board Exams and then becoming the inaugural chair of the Core Exam Thoracic Committee in 2009.

Robert C. McKinstry, PhD, MD, professor of radiology, has been selected as an ASNR (American Society of Neuroradiology) Outreach Professor to South Africa for 2017. The main objectives of the program are to facilitate the exchange of knowledge and techniques, and to teach, including traditional lectures, case and teaching file reviews, and direct teacher-to-student interaction.

Yuan-Chuan Tai, PhD, associate professor of radiology and interim director of Mallinckrodt’s Radiological Chemistry and Imaging Laboratory (RCIL), was
Suresh Vedantham, MD, professor of radiology, began a term as president-elect of the Society of Interventional Radiology in April 2016; he will become president (one-year term) in March 2017. He also served as co-chair of the National Heart, Lung, and Blood Institute (NHLBI) Working Group on Designing Clinical Trials of Uncommon Disorders and Therapeutics on May 2–3, 2016.

**APPOINTMENTS/ PROMOTIONS**

Monica Shokeen, PhD, MBA  
Assistant professor of radiology and biomedical engineering, was appointed to Washington University School of Medicine’s Division of Biology and Biomedical Sciences (DBBS) faculty in its Molecular Cell Biology program.

**CORRECTION**

In the Spring 2016 issue of Focal Spot, Mehrdad Sehizadeh, MD, below right, was incorrectly identified as the husband of Mallinckrodt researcher Parinaz Massoumzadeh, PhD, with whom he is pictured. Sehizadeh, a former neuroradiology fellow at MIR, is actually the husband of Cylen Javidan-Nejad, MD, associate professor of radiology in the cardiothoracic imaging section. Focal Spot apologizes for the error.

MIR IT project manager Ken Clark, BS, MS, MBA, was honored recently for 46 years of service to Washington University, making him the most senior retiree at the School of Medicine’s 2016 Length of Service Award ceremony in July 2016. Clark, who retired this past January, spent the first 27 years of his Washington University career in the Biomedical Computer Laboratory. In 1997, former MIR director R. Gilbert Jost, MD, hired him to join Mallinckrodt’s Electronic Radiology Laboratory. While there, he was instrumental in the department’s transition from a film-based specialty to one that was digital. “Ken was a wonderful addition to the team,” says Jost. “His technical and scientific skills, which were significant, were highly relevant to the problems at hand, but particularly noteworthy was his ability to get along with everyone. He was a leader, but also a great team player.”

**ROCK DOC**

Monica Shokeen, PhD, MBA, assistant professor of radiology in MIR’s Optical Radiology Laboratory (ORL), was celebrated as a “Rock Doc” at the 11th annual CUREiosity party held in downtown St. Louis at the Four Seasons Hotel on September 30, 2016. The event honors individuals making a difference at the Alvin J. Siteman Cancer Center as well as the cutting-edge “rock star” research being conducted at the institution. Shokeen’s research focuses on small molecule and macromolecular agents for imaging and targeted drug delivery for cancer and cardiovascular diseases. Shokeen is leading the development of novel contrast agents that detect multiple myeloma with high accuracy. This work will allow doctors to monitor how patients are responding to treatment and target specific treatments to appropriate patients.
FYI

RADIOLOGY 101
Community members learn about imaging basics at mini-medical school

Constantine A. Raptis, MD, assistant professor of radiology, compares his role as a radiologist to that of those searching for "Waldo," the children's book character who wears a red and white striped shirt and stocking cap while hiking around the world. But instead of looking for the cartoon character who is deftly hidden in a maze of activity with similarly dressed red herrings, radiologists search a myriad of internal body images to diagnose what may be wrong with patients. "I'm always looking for Waldo," Raptis says.

That was just one of the messages delivered by Raptis during a recent presentation at Washington University School of Medicine's Mini-Medical School. Begun in 1999, Mini-Medical School offers the general public (ages 15 and up) a unique opportunity to learn about medical education and patient care. Raptis was one of 16 medical school faculty making presentations in the latest eight-week session. The program is in its 17th year, but this was a first-time event for Raptis, whose lecture was titled "Grey Anatomy: Medical Imaging and Radiation."

Raptis had several objectives for his presentation. "I wanted the audience to learn about the five most frequently used modalities in modern imaging: conventional radiography, computed tomography, magnetic resonance imaging, ultrasound, and nuclear medicine. I also wanted them to understand the strengths and weaknesses of each modality and their application, as well as have a basic understanding of the effects of radiation."

It was a tall order packed in a 60-minute time frame, which also included a patient case. Mini-medical students were challenged to identify the imaging test that would determine the correct diagnosis of a 46-year-old man experiencing severe chest pain potentially due to a myocardial infarction, pulmonary embolism, or aortic dissection.

After the lecture, Raptis fielded some questions from the audience. They included:

**What type of radiology exam is a screening mammogram?**

It's basically the same technology as a chest X-ray but you are focusing on the breast.

**Is calcium screening done with CT?**

Yes. As a non-contrast CT, it's just an exam of your heart. We're looking to see if your vessels have any calcium on them or any narrowed areas. We use risk to stratify patients.

**Why is the breast squeezed during a mammogram?**

You wouldn't be able to see through the breast if it wasn't compressed. By flattening the breast out, you are making it less thick so the X-ray can penetrate it at a dose that is reasonable.

**How dangerous is it for me to stand in front of a microwave?**

That's not risky. You'll be okay.

**Why come to Mallinckrodt Institute of Radiology?**

We have more than 100 diagnostic radiologists on our faculty with a wealth of accumulated knowledge. When you get an imaging exam at Mallinckrodt, it's going to be read by someone who is a subspecialist in the body part being imaged. That, along with having the newest equipment available, is a huge benefit.

After the presentation, some participants milled around the lectern, waiting to talk to Raptis. They included a young man, a high-school senior. "He was interested in a career in medicine that involved computers and thought that radiology might be a good idea," says Raptis. "I told him once he gets to college, he should try to touch base with some radiologists at that institution to shadow them and potentially get involved in some research projects."

Like searchers for Waldo, the earnest high-school senior was on a seek-and-find mission. Raptis may have just helped him find his way. To learn more about Mini-Medical School, please visit minimed.wustl.edu.

AWARDS

Thirty-nine Mallinckrodt Institute of Radiology faculty are among 1,267 physicians in the St. Louis region to be named as 2015–16 Best Doctors by St. Louis magazine. Nominated by their peers, the honorees are considered to be among the nation's most respected specialists. To see the full list of MIR honorees, visit mir.wustl.edu, then click on Patient Care, Why Choose MIR?, 2015–16 Best Docs.
Mallinckrodt Institute of Radiology, the Department of Radiology at Washington University School of Medicine, is working to strengthen its reputation for excellence — through outstanding resident and fellow education programs, pioneering research, and innovative advances in patient care. Philanthropic resources play an important part in the continued advancement and future work of Mallinckrodt and those who train in its programs.

There are many ways you can make a gift to support Mallinckrodt Institute of Radiology — from joining the Eliot Society with a gift of $1,000 or more to a larger gift opportunity, such as supporting an endowed professorship.

Online donations can be made at gifts.wustl.edu. To ensure that your donation is designated for Mallinckrodt Institute of Radiology, please follow these directions:

• At Designation Options, please choose the fourth box marked “Other”
• Type in Mallinckrodt Institute of Radiology in the space provided

For more information, please contact:

Medical Alumni & Development Programs
Campus Box 1247
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St. Louis, MO 63105-2161
(314) 935-9691
A LOOK BACK

A  Mallinckrodt Institute of Radiology (MIR)
The new facility opened to great acclaim for its magnificent design, state-of-the-art technology, and forward-thinking safety features.

B  MIR adds new floors, circa 1969

C  Diagram showing each floor’s function

D  Expansion construction
A workman holds an American flag, marking the last load of cement to be poured.

E  Plans show the building’s original layout

Images courtesy of Mallinckrodt Institute of Radiology Archives

MIR TOWER CONSTRUCTION

After a tumultuous planning period, Mallinckrodt Institute of Radiology opened in 1931 to great fanfare. Newspapers praised every inch of it, starting with its exterior of brick and Bedford stone, designed in the Italian Renaissance style. Eight stories high, it was built so that four additional stories could be added at a later date. The building was designed with safety in mind, with precautions taken to guard against fire or explosion, including a complete sprinkling system on the main floor where active files were kept and fireproof vaults for the permanent collection. Today, the MIR building remains intact, although it is largely encased within Barnes-Jewish Hospital. Recent renovations to services on several floors of the tower continue the tradition of expansion and refurbishment to suit the changing needs of the specialty and the patients it serves (see page 20).
MIR annual Cardinals baseball game outing this past September. Pictured, from left to right: Vinnie Melnick, MD, and Rich Wahl, MD; Whitney Sipe, MD, diagnostic chief resident, and husband Adam Sipe, MD, fourth-year resident; Rebecca Chernock and Costa Raptis, MD.