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Image-guided Video-assisted Surgery Targets Lung Masses

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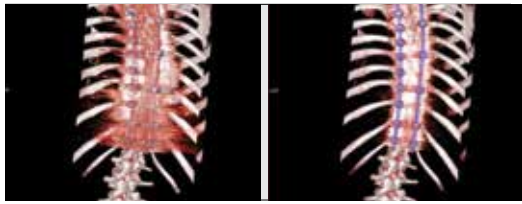


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RSNA 2016 Plenary Lecturers

The RSNA Board of Directors has announced the distinguished individuals who will deliver honored lectures at the 102nd Scientific Assembly and Annual Meeting.



Wachter

Opening Session Lecture

"Hope, Hype, and Harm as Medicine Enters the Digital Age: Lessons From (and for) Radiology"

Robert M. Wachter, MD
San Francisco



Dreyer

Opening Session Lecture

"When Machines Think: Radiology's Next Frontier"

Keith J. Dreyer, DO, PhD
Boston



Hricak

New Horizons Lecture

"Beyond Imaging: Radiology of Tomorrow"

Hedvig Hricak, MD, PhD, Dr(hc)
New York City



Lee

Annual Oration in Diagnostic Radiology

"The Transformation to Value-Driven Health Care"

Vivian S. Lee, MD, PhD
Salt Lake City, Utah



Lawton

Annual Oration in Radiation Oncology

"Prostate Cancer: Improving the Flow of Research"

Colleen A. Lawton, MD
Milwaukee

RSNA® 2016

Numbers in the News

5,700

Size—in square feet—of the AMIGO Suite, a surgical research environment housing advanced imaging equipment. Read about image-guided lung cancer research underway at the AMIGO Suite on [Page 11](#).

600

The number of SA-CME offerings in RSNA's eLearn Online Library. Read more about RSNA's full roster of CME resources on [Page 21](#).

60

The percentage of RSNA's followers on social media who are in the 25-44 age range. Read about the RSNA Resident and Fellow Committee's discussion about engaging more trainees in networking on [Page 13](#).

50

Number of institutions that have implemented RSNA's Diagnosis Live™ online audience response system. Read more about this and other mobile technology transforming radiology education on [Page 9](#).

Castillo Named New ARRS President

Mauricio Castillo, MD, was named president of the American Roentgen Ray Society (ARRS) during its recent annual meeting in Los Angeles.

Dr. Castillo, an author, professor and radiologist, has served as the chief of the division of neuroradiology and professor of radiology at the University of North Carolina in Chapel Hill, N.C., for 23 years. Born in Guatemala, Dr. Castillo received his training in diagnostic radiology at the University of Miami, followed by a two-year neuroradiology fellowship at Emory University in Atlanta.

A prolific author and peer reviewer, Dr. Castillo's 5th edition of "Neuroradiology Companion" is to be published later this year. He has served as a manuscript reviewer for *Radiology* and as the neuroradiology/head and neck subcommittee chair of the RSNA Scientific Program Committee from 2006 to 2009.



Castillo

Fifth Annual International Day of Radiology Focuses on Breast Imaging

On Nov. 8, join more than 140 radiology-related professional societies from around the globe in celebrating the advances that radiologic innovations have brought to patients worldwide.

This year, the International Day of Radiology (IDoR) is dedicated to breast imaging and the essential role that radiologists play in the detection, diagnosis and management of diseases of the breast.

IDoR is sponsored by RSNA, the European Society of Radiology (ESR) and the American College of Radiology (ACR), with a dedicated website (IDoR2016.com) and social media activities. The sponsoring societies are joined by the



INTERNATIONAL
DAY OF
RADIOLOGY
AN INITIATIVE OF RSNA, THE ESR AND ACR

Society of Breast Imaging (SBI), European Society of Breast Imaging (EUSOBI), and the Image Wisely® and EuroSafe Imaging campaigns in recognizing the significance of our specialty in breast healthcare.

Visit RSNA.org/IDoR for promotional materials you can customize for your practice or organization.

QIBA Annual Meeting Highlights Efforts to Contribute to NIH Research



Approximately 90 stakeholders, representing imaging clinicians, physicists, industry and government, gathered recently in Alexandria, Va., for the 9th RSNA Quantitative Imaging Biomarkers Alliance (QIBA) Annual Meeting.



QIBA's Annual Meeting fosters stakeholder collaboration and information sharing among members of academia, the medical device industry, pharmaceutical and other business sectors, and government.

During the two-day meeting, plenary speakers from two National Institutes of Health (NIH) institutions, the National Institute of Biomedical Imaging and Bioengineering (NIBIB) and National Institute of Mental Health (NIMH), provided insights on how QIBA efforts could contribute to ongoing NIH research priorities and high-profile initiatives, including the Precision Medicine Initiative, the Brain Research through Advancing Innovative Neurotechnologies® (BRAIN) initiative and Cancer Moonshot.

Three panel sessions engaged participants in discussions on topics of cross-modality interest: claim guidance, profile feasibility testing and profile conformance. Reports from the four modality coordinating committees highlighted QIBA activities, accomplishments and challenges of the past year.

Significant portions of each day were dedicated to working meetings of the various biomarker committees, allowing them to advance their profile development and discuss groundwork projects and strategies for profile deployment and adoption.

AIUM Presents Annual Awards



Timmerman



Papageorghiou



Sidhu



Kolios

The American Institute of Ultrasound in Medicine (AIUM) presented **Dirk Timmerman, MD, PhD**, the William J. Fry Memorial Lecture Award at its recent annual meeting in New York City.

The AIUM also bestowed honorary membership to **Aris T. Papageorghiou, MD**, and **Paul Sidhu, BSc, MBBS, MRCP**.

Other honorees included **Michael C. Kolios, PhD**, (Joseph H. Holmes Basic Science Pioneer Award), **Alfred Abuhamad, MD**, (Joseph H. Holmes Clinical Pioneer Award), **John Christian Fox, MD**, (Peter H. Arger Excellence in Medical Student Education Award), and **Daniel A. Merton, BS** (Distinguished Sonographer Award).



Abuhamad



Fox



Merton

IN MEMORIAM



Friedland

Gerald W. Friedland, MD

Renowned clinical radiologist, researcher and administrator Gerald W. Friedland, MD, died April 2 in Las Gatos, Calif. He was 82. Born in Pretoria, South Africa, Dr. Friedland was a professor emeritus of radiology at Stanford University School of Medicine and a Fellow of the Royal College of Physicians of Edinburgh. Dr. Friedland was also the former chief of the Veteran Affairs (VA) medical center in Palo Alto, Calif. He published more than 100 medical articles, 35 book chapters and contributed to four books, including, "Medicine's 10 Greatest Discoveries," which led him to organize the first Pioneering Women in Medicine conference in 2000. The Palo Alto VA hospital named the Gerald W. Friedland Learning Center in his honor. He also received a Lifetime Achievement Award from Stanford.

THIS MONTH IN THE RSNA NEWS ONLINE VERSION

Get more of this month's news online at RSNA.org/News.

As part of this month's story on image-guided, video-assisted thoracic surgery (iVATS), *RSNA News* features a video of the technology in the AMIGO Suite at Brigham and Women's Hospital (BWH) as well as video interviews with Stephen E. Seltzer, MD, and Michael J. Zinner, MD, discussing the technology.

Editor's Note

A production error resulted in extraneous copy appearing in the article "Unique Stressors Lead to Burnout in Radiology" in the June issue of *RSNA News*. A corrected story is available online at RSNA.org/News. We apologize for the error.

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LOOK AHEAD

The Future of PEDIATRIC RADIOLOGY

BY MARILYN J. SIEGEL, MD

Since the discovery of the x-ray, advances in technology have revolutionized imaging, impacting the diagnosis and treatment of disease. Imaging will continue to evolve and improve, resulting in more detailed anatomic and functional data, allowing earlier and more accurate diagnoses and better, more successful treatment. Here are a few of my predictions for improvements in imaging technology in pediatric radiology over the next decades.

The Nearer Future: Advances in Imaging Technologies

CT—New Methods Allow for Radiation Dose Reduction

Individualizing CT scanning techniques according to patient size and attenuation and the clinical indication for CT will result in further reductions of radiation exposures to the point where they may be comparable to those of conventional x-ray imaging.

Look for more use of low-dose scanning at 70 and 80 kilovoltage (kV) in cardiothoracic imaging in all pediatric patients, not only small children. The widespread use of low kV has been impeded by the limited power reserves of available x-ray tubes. Modern x-ray tubes provide substantial power reserves at low kV settings and thus enable dose-efficient low kV scans for all children, including those who are obese. To facilitate the lower kV selection, more automated kV selection technologies will emerge, offering the advantage of optimizing both milliamperages (mAs) and kV selection, maintaining both image quality and low dose. That makes CT a robust examination for reliable evaluation of cardiothoracic diseases in children.

Faster scanning with wide-beam or high-pitch scanners, which offer high temporal resolution and speed, thus limiting motion artifacts and reducing radiation exposure respectively, should become routine in clinical practice. CT scans will become so fast that the issues of motion and breath-holding may no longer be a major concern in pediatric CT. In addition, the benefits of better temporal resolution and speed will improve the practice of cardiac CT in young patients, where rapid heart rates and high radiation doses have been limiting factors.

In terms of technology, more research and eventually clinical use of phase-contrast CT imaging and photon-counting CT will improve image quality and lower radiation output. Both technologies may allow for more detailed tissue characterization and material discrimination at lower radiation doses than conventional scanners. Photon scanning will also offer the potential for “energy-selective” data, with multi-energy discrimination. Also look for low-dose scanning using optimized spectral shaping (tin filtration) to lower radiation dose.

Finally, look for changes in reporting radiation exposure. One can envision manufacturers reporting size-specific dose estimates (SSDE) at the scanner console and populating Digital Imaging and Communica-



Siegel

MARILYN J. SIEGEL, MD

A recognized leader in pediatric radiology, Marilyn J. Siegel, MD, is a professor of radiology and pediatrics at Washington University School of Medicine in St. Louis, with a special interest in cross-sectional imaging techniques in evaluating pediatric disease. She is also an experienced thoracic radiologist.

Dr. Siegel's extensive research contributions have focused on the assessment of radiation dose from diagnostic imaging and oncologic CT and MRI applications. She is co-director of the Imaging Response and Assessment Core (IRAC) at the Washington University Siteman Cancer Center and serves as chair of the Diagnostic Imaging Committee for the Children's Oncology Group, a National Cancer Institute-supported clinical trials group devoted exclusively to pediatric cancer research.

She authored a comprehensive textbook on pediatric body CT, titled "Pediatric Body CT," now in its second edition, and the definitive textbook on pediatric ultrasonography, "Pediatric Sonography," now into its fourth edition.

Dr. Siegel is active in RSNA, the American Roentgen Ray Society and the Society of Computed Body Tomography/MRI.

tions in Medicine (DICOM) headers and structured reports, so that SSDE becomes an integral part of radiation dose tracking.

The Move to Material-specific Imaging: Dual-energy CT

Dual-energy CT will become an important tool in clinical pediatric imaging. In CT, materials with different elemental compositions can have identical CT numbers, making the differentiation and classification of different tissue types challenging. The ability of dual-energy CT to differentiate materials of different elemental compositions should lead to an evolution in the clinical applications of dual-energy CT in children. Also look for photon counting CT to take us from dual-energy CT to multi-energy CT in the future.

Benefits of CT Advances:

Monoenergetic images will improve image quality. The use of high kiloelectron voltage (keV) to decrease image noise and minimize artifacts in patients with metal implants will improve visualization of soft tissues and bone, and lead to more confident diagnoses (*See image, this page*). On the other hand, low keV will be used to visualize iodine, which will increase conspicuity of subtle lesions and compensate for poor venous access from slow injection rates in small intravenous catheters.

Automated bone subtraction in CT angiography can provide a bone-free view of the vascular system and deliver high-quality images for confident diagnoses.

Iodine maps will improve characterization and conspicuity of masses in solid organs. In the bowel, these maps can help in the diagnosis of bowel inflammation or ischemia by show-

ing the iodine distribution. In oncology, this technology opens up the possibility of documentation of therapy response by quantification of tumor size and iodine uptake.

Lung perfusion will allow a comprehensive evaluation of the pulmonary vessels. Watch for its use in cyanotic congenital heart diseases to assess overall perfusion to the lungs before and after surgical repair and in the evaluation of perfusion defects in pulmonary embolism and pulmonary hypertension.

Ultrasound—Increasing Roles for Elastography

Ultrasound continues to pull tricks out of a seemingly bottomless hat. In chronic liver diseases, elastography has shown great promise in noninvasively detecting fibrosis severity. Watch for more research on the impact of this technology on outcomes, including fewer biopsies and better identification of patients who may be candidates for interventional therapies.

In the musculoskeletal system, elastography is increasingly being used in the evaluation of acute tendon injuries, but look for increased use in inflammatory myopathies. Quantification of muscle stiffness at rest (passive findings) and over a course of gradual isometric contractions or following exercise (dynamic findings) opens a new frontier for monitoring treatment outcomes and predicting functional prognosis.

MRI—Faster, Easier

Future MR imaging will be faster and easier to perform while yielding exquisite image detail and multi-parametric characterization of anatomy and function. As a result, stud-



A young male teen with posterior spinal fusion for scoliosis repair. Left: Coronal volume rendered imaging shows metal artifacts obscuring the surrounding tissues. **Right:** Coronal image with monoenergetic imaging at 120 keV substantially reduces the metal artifacts and improves evaluation of the metal rods and surrounding anatomic structures. Image courtesy of Marilyn Siegel, MD.

ies will be completed faster, reducing duration, depth and frequency of anesthesia for pediatric examinations.

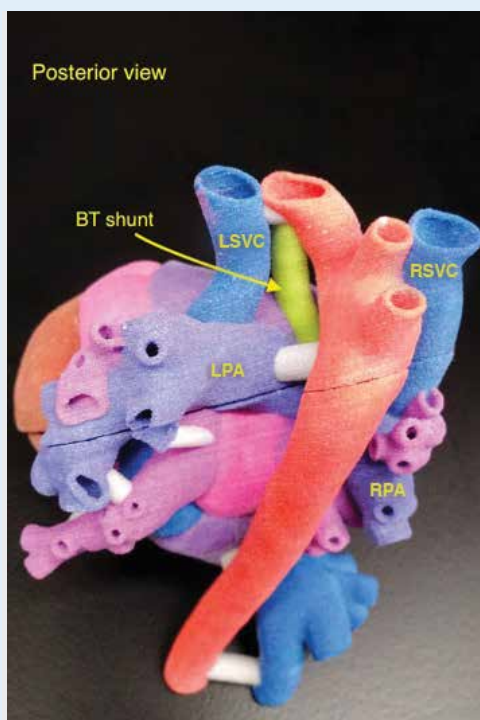
New MRI methods are also poised to reduce examination times by generating multiple pulse sequence images from a single MRI exam. For example, a single brain exam that synthesizes six pulse sequences (e.g. short tau inversion recovery (STIR), T1-weighted fluid attention inversion recovery (FLAIR), T2-weighted FLAIR, T1-weighted, T2-weighted and proton-density) can be completed in one-third of the total time taken to use each sequence separately with conventional methods.

For cardiovascular MRI, 4-D flow imaging collects both time-resolved anatomic and blood velocity information at every location in a 3-D volume with a single free-breathing, 10-minute examination. Thus 4-D flow simultaneously provides in 10 minutes of imaging the key elements of a cardiac examination (anatomy, function and flow) that conventionally are acquired serially in over 60 minutes of imaging and patient breath-holding. For lung imaging, the potential of ultrafast sequences will allow dynamic assessment of lung anatomy and function during the entire respiratory cycle. MRI will likely become the preferred method of imaging children with chronic lung diseases, such as cystic fibrosis and lung transplantation-related bronchiolitis obliterans, replacing CT, which has been the standard modality.

3-D Printing Emerges into Clinical Practice

3-D printing is a rapidly growing technology for management of pediatric patients with cardiac and vascular malformations. 3-D printing aids understanding of complex 3-D relationships, and is being used increasingly for pre-surgical planning in congenital cardiovascular disease (*See image, this page*). This technology represents a new frontier of highly precise and personalized medicine, promising improved surgical and post-operative outcomes. Besides surgical planning, 3-D models are effective tools for education, procedure simulation and patient counseling.

Thus, 3-D printing is poised to revolutionize the practice of medicine in congenital heart disease. Also expect the technology to be increasingly used for planning craniofacial and maxillofacial surgery and in the musculoskeletal system for planning osteotomies, fracture fixations and arthroplasties.



3-D printed cardiac model of a child with double outlet right ventricle, posterior view. The 3-D printing provides tangible depth information of anatomy and vascular relationships. BT = Blalock Taussig shunt, LSVC = left superior vena cava, RSVC = right superior vena cava, LPA = left pulmonary artery, RPA = right pulmonary artery.

Image courtesy of Anwar Shafkat, MD, Washington University School of Medicine, St. Louis.

Further into the 21st Century: Moving Toward Precision Imaging

In the era of precision or personalized medicine, pediatric radiology has the opportunity to help deliver the right treatment at the right time. By identifying which subgroups of patients have similar characteristics and are likely to benefit from the same therapies, more efficient clinical trials can be done with the goal of treating patients based on the precise characteristics of their disease. In the quest for precision imaging, a merger of morphologic and molecular information is likely to be critically important. Radiogenomics, linking imaging phenotypes to genotypes, and hybrid imaging using combined PET/MRI systems — which enable PET functional imaging to be anatomically co-registered with MRI — have already shown promise to characterize the molecular infrastructure, and should greatly contribute to patient-tailored care.

Optical imaging is the new kid in the imaging armamentarium. Optical spectroscopy for characterizing molecules via absorption and fluorescence spectra has been shown

to be useful for tumor diagnosis in preclinical trials. In early clinical trials in adults it has been used to diagnose brain disorders, monitor treatment response, and guide intraoperative tumor biopsy. The future likely will include co-registration with 3-D imaging modalities, allowing rapid, whole-body fluorescence imaging. Its combination of high-detection sensitivity, real-time feedback of diagnostic information, and repeat measurement capability without harming healthy tissue holds great promise for imaging children in the age of precision medicine.

Disruption and Opportunities

As we transition from the era of depicting anatomy to the era of functional and molecular imaging, new technologies will create disruption and new responsibilities, including the need for increased learning and education. But they also will bring great opportunity. We will see a continued decrease of radiation exposure to the population, more accurate clinical diagnoses that will improve patient care, and more personalized healthcare. If pediatric radiologists embrace the challenges and build on the opportunities, our subspecialty — which has always been known for its innovation — will continue to grow and thrive in the years to come.

BOOST Forges Ties Between Radiology, Radiation Oncology

BY MIKE BASSETT

Nearly a decade since it was introduced, the RSNA BOOST program has become a staple of RSNA annual meetings and continues to build on its core goal of bringing radiologists and radiation oncologists together to improve patient care.

Under the leadership of the RSNA Board of Directors and then-board member Sarah Donaldson, MD, BOOST (Bolstering Oncoradiologic and Oncoradiotherapeutic Skills for Tomorrow) was the brainchild of the RSNA Oncologic Imaging and Therapies Task Force with guidance from former co-chairs David Panicek, MD, and the late Steven Leibel, MD.

Since it was first added to the RSNA annual meeting in 2007, BOOST has drawn hundreds of attendees to the four-day program that continues to forge ties between radiology and radiation oncology.

One of the goals was to further engage radiation oncologists at the RSNA annual meeting, said Bruce Haffty, MD, RSNA Board of Directors liaison for science who also co-chaired the task force.

“The radiation oncology component of the annual meeting is relatively small, so providing radiation oncologists with a program they could identify with was one of the driving forces behind it,” said Dr. Haffty, interim director, Rutgers Cancer Institute of New Jersey, and professor and chair, Department of Radiation Oncology, Robert Wood Johnson Medical School and Rutgers New Jersey Medical School.

It was also becoming increasingly clear that imaging — both from a planning and delivery perspective — was a key component of radiation oncology and that RSNA annual meetings provided the ideal forum to bring the two disciplines together.

BOOST sessions are structured

according to disease site. For example, during last year’s annual meeting, the Monday BOOST sessions focused on head/neck and gynecology.

Dr. Haffty said the BOOST format has traditionally involved three components — a morning session focusing on anatomy, a mid-day session focusing on education, and an afternoon session that is case-based. That format has remained essentially the same except for the addition of a contouring component around 2010. Participants include radiation oncologists and diagnostic radiologists.

“People come into that contouring session and many have even done homework before the session,” Dr. Haffty said. “It could be focused on pancreatic cancer and the participants would work on issues including where they should contour, and whether to treat the pancreas or treat the lymph nodes. It’s web-based and very hands-on.”

The contouring session basically works like a collaborative workshop, with attendees assisting each other during the exercises.

“One nice thing about the contouring session is that radiation oncologists and diagnostic radiologists are learning together,” Dr. Haffty said. “So it has become a very popular session.”

BOOST Expands in Scope, Popularity

What kind of an impact has the BOOST program had in nearly a decade of sessions?

“It’s certainly been well received,” said Colleen Lawton, MD, vice-chair of the Department of Radiation Oncology at the Medical College of Wisconsin, Milwaukee,



Lawton



Haffty

who has presented numerous BOOST sessions over the years. “I have always received positive feedback during my sessions and people show up year after year.”

Dr. Haffty agreed. “People vote with their feet, and BOOST is still a very popular program at the RSNA annual meeting.”

As a frequent presenter of sessions on prostate cancer, Dr. Lawton said the BOOST program provides radiation oncologists with both a refresher and an opportunity to review the new, cutting-edge methods used to treat certain cases of prostate cancer. And from a diagnostic radiology perspective, Dr. Lawton said these sessions help on a number

of levels.

“They help us understand how diagnostics can help radiation oncologists in terms of making good decisions for our patients,” Dr. Lawton said.

Radiation oncologists agree the sessions are mutually beneficial.

“The RSNA BOOST program is really a revolutionary educational effort fulfilling the needs of both radiation oncologists and radiologists who look after cancer patients,” said Simon S. Lo, MD, professor of radiation oncology and director of neurologic radiation oncology, University Hospitals Seidman Cancer Center, Case Western Reserve University, Cleveland.

Dr. Lawton likes to remind BOOST presenters that they are speaking to both radiation oncologists and radiologists.

In preparing her RSNA 2016 Annual Oration in Radiation Oncology, “Prostate Cancer: Improving the Flow of Research,” Dr. Lawton said, “Clearly I have to be able to speak to our diagnostic colleagues.”

The relationship between radiologists and radiation oncologists has always been “collegial and symbiotic because of the dependence of the oncologic piece on diagnostics, and vice versa,” Dr. Lawton noted. “What BOOST does is help develop a better understanding of how radiologists and radiation oncologists can specifically better manage their patients.”

“What BOOST does is help develop a better understanding of how radiologists and radiation oncologists can specifically better manage their patients.”

COLLEEN LAWTON, MD

Patient's Painting a Tribute to Radiologist's Dedication

BY BETH BURMAHL

The beautiful, gold-framed painting that holds a place of honor in the home office of Albuquerque, N.M., radiologist Michael Linver, MD, offers a daily reminder of the impact he has made on the life of one special patient.

Considering the dedication Dr. Linver, also known as “Mammo Mike,” has shown to patients throughout his three decades in breast imaging, the painting titled “Angel of Goodness” likely reflects the sentiments of hundreds of others.

“Thank you so much for all you do for so many,” wrote patient/artist Janis Loverin on the back of the artwork she presented to Dr. Linver in 2015. “I appreciate your dedication to helping women with breast cancer so very much...only a really trained eye would have seen my Stage I breast cancer.”

The painting is part of Loverin's “Agent of Goodness” Earth Angels series depicting “Blessengers,” as she calls them, who come to guide, bless and rescue.

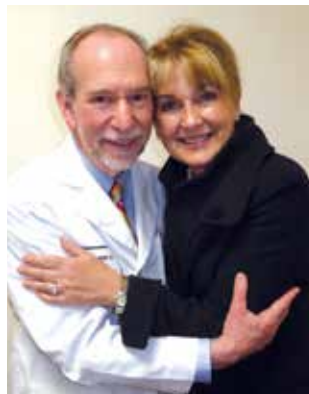
Dr. Linver, of the Breast Imaging Center of X-Ray Associates of New Mexico, says he was “overwhelmed” by the painting that is also featured on RSNA's Radiology Cares® online Caring Quilt, a virtual patchwork of patient messages of thanks to radiologists and radiology department teams.

A pioneer in the movement now known as patient-centered care, Dr. Linver established his approach to patient care early in his career. When he became a breast imager in the 1980s, he quickly realized the importance of giving each patient the individual attention that has kept many coming back for decades. One example: because Albuquerque is a very rural area, some patients drive 200-300 miles for an appointment. Dr. Linver makes sure he sees these patients in person.

“I do give them special attention,” he said. “And if I have long-standing patients who I've known for decades, I'll go out



Patient/artist Janis Loverin presented the painting, “Angel of Goodness,” to radiologist Michael Linver, MD, in honor of the care and dedication Dr. Linver shows his patients.



Linver, Loverin

and say ‘hi’ and give them a hug.”

Over the years, Dr. Linver's practice has grown considerably. Because he now screens 40-50 patients a day, he spends hours doing batch screenings and often does not have time to speak to each patient. But he still manages to provide that personal touch. For patients who want same-day results, Dr. Linver asks for their contact information and calls them at the end of the day.

“I call roughly 10 to 12 people each day to discuss their cases,” he said. “I call at a time when I'm free to talk. It's extremely important to me to give them that personal contact.”

When he performs a biopsy, he gives the patient his home phone number as well as a personal email address. He also provides those patients with a connection to a surgeon, just as he did with Loverin, who Dr. Linver says is doing very well. “When we detect something suspicious in a breast screening, 95 percent of patients have promising outcomes,” he said.

While Dr. Linver is a busy lecturer on mammography, having presented more than 900 talks throughout the U.S. and in over 20 countries, he is also an in-demand speaker on patient-centered care and has presented sessions at numerous radiology conferences, including RSNA annual meetings. Although breast imaging and patient-centered care are two different

topics, Dr. Linver says they are part of the same issue.

“We teach radiologists to do this great thing in reading images, but we teach them very little about relating to the patient, which is just as important,” he said. “My approach has always been patient-centered, and now the entire profession is aware that this is vital to our success and future.”

WEB EXTRAS

☑ To access the Caring Quilt and other resources available through RSNA's Radiology Cares®, go to [RSNA.org/Radiology-Cares](https://www.rsna.org/Radiology-Cares).

Mobile Technology Takes Radiology Education to a New Level

BY LYNN ANTONOPOULOS

In the five years since the University of Colorado (CU) first developed its radiology resident iPad toolbox, the use of mobile devices in resident education has steadily increased at the university and other institutions across the country.

Initially, the tablet-based resource provided residents with access to large educational volumes otherwise difficult to transport. Although electronic books are likely the most utilized toolbox component today, innovative audience response systems such as RSNA's Diagnosis Live™ and a host of new apps have paved the way for next-level implementation of mobile technology.

Widely recognized as the institution that pioneered a comprehensive mobility strategy for radiology resident education — the radiology department at CU pre-loaded its iPad toolbox with e-Anatomy, RadPrimer and STATdx reference sites, educational texts, exam study guides, and radiology teaching website links among other apps. The device quickly became a go-to resource for radiology residents that increased studying efficiency and accessibility to educational resources.

With help from staff at CU, Indiana University (IU), Indianapolis, followed this model by pre-loading residents' iPads with radiology resources with similar success.

"The iPad is a very effective and efficient e-reader for these materials," said



Kamer



Deshmukh

Aaron P. Kamer, MD, assistant professor of radiology at IU who helped develop the school's iPad toolbox. "Carrying a 1.5-pound iPad that contains scores of 9.5-pound books is very appealing."

Dr. Kamer added that using the iPad as an e-reader and as a web browser for some of the more popular radiology reference sites (STATdx, Radiopaedia, *headneckbrain-spine.com*, e-Anatomy) are two of the most common uses by radiology residents at IU.

One self-study app, "Anki," allows IU residents to memorize common radiology facts. Residents create flashcards using the app, and then transfer and share the flashcards for studying, Dr. Kamer said.

At CU, Kris Schramm, MD, a chief res-

ident, created the iPhone app IRONCALL as a quick reference for residents-in-training, medical students, fellows and attending radiologists in interventional radiology (IR). The application is for on-call-related management questions across IR and is used in real time at the bedside when access to traditional texts is not feasible.

And in 2015, CU unveiled a state-of-the-art Beginning to Advanced Radiology (BAR) Lab, designed to facilitate blended learning including flipped classroom and team-based learning methods. For the flipped learning component, instructors use an Apple TV and whiteboard application to facilitate workshops. "Students complete an online MedU Core module before coming to class then are asked to apply knowledge gained from the modules in class room by annotating the iPad to identifying normal structures as well as pathology," said Nicole Restauri, MD, assistant professor of radiology and Bar Lab director at CU.

The lab is equipped with a virtual simulation teaching PACS identical to the clinical application currently used throughout



A popular draw at RSNA annual meetings (left), Diagnosis Live™, the interactive, quiz-based audience response system introduced by RSNA in 2011, is now used for radiology education at 50 institutions.

“Carrying a 1.5-pound iPad that contains scores of 9.5-pound books is very appealing.”

AARON P. KAMER, MD

the University of Colorado Health System and utilizes iPads to deliver curriculum.

Quiz-based Learning is the Next Big Thing

Interactive, quiz-based applications are making a significant impact on the lecture experience for radiology residents by allowing educators to move beyond the didactic approach to a more Socratic method of teaching.

RSNA took mobile education to a new level by introducing its online audience response system, Diagnosis Live, in 2011. In the interactive program, the lecturer uploads a PowerPoint presentation and uses the online authoring feature to create embedded questions that are answered by participants using tablets or smartphones.

Initially tested at only a few locations, Diagnosis Live is now being used at 50 institutions and is a popular draw at RSNA annual meetings.

Sandeep Deshmukh, MD, an associate professor of radiology at Thomas Jefferson University, Philadelphia, who participated in Diagnosis Live beta testing, has received excellent feedback about the system's efficacy in the classroom.

“While residents and faculty acknowledge that some didactic content is still needed, residents prefer the quiz-based format of Diagnosis Live,” Dr. Deshmukh said. “Personally, I have gone to an almost entirely Diagnosis Live format with classroom flipping to deliver didactic content.”

Mobile devices allow for increased accessibility to other electronic resources. For example, the popular Diagnosis Please feature in RSNA's *Radiology* journal offers mobile users the chance to diagnose radiology cases submitted by readers.

Tablets will become further integrated into radiology education as time and research prove their value, said Marc Kohli, MD, director of clinical informatics and associate professor of clinical radiology in abdominal imaging at University of California San Francisco, who was a radiologist at IU when the iPad toolbox was developed.

“As far as resident education and radiologist continuing education goes, I see a shift away from traditional didactic in-person lectures toward online video and quiz questions becoming more important,” Dr. Kohli said. “Tablets are well positioned to be a convenient avenue for consumption of this content as it's created.”

Mobile Education Enters Next Phase

Despite the enormous progress in a short time, barriers — including time and funding constraints — continue to prohibit a more rapid and complete adoption of mobile technology in radiology education.

“The next phase is creating an overall vision of how to use mobility to change the learning environment,” said Harprit Bedi, MD, vice-chair of radiology and associate radiology professor at Tufts University School of Medicine, Boston, which began offering its residents tablets in 2011. “Then we need the resources to develop a plan that can have an impact.”

Dr. Bedi stressed that the specialty needs more apps and tools created by radiologists for radiologists. “Most resources out there are made for K-12 learning environments and we are trying to best apply those resources to our field,” he said.

Still, shortages in time and money have not resulted in a lack of ideas. Thinking ahead, Dr. Kamer said, “I would love to explore using some of our department's informatics resources to develop future educational or education administration apps to streamline processes like conference evaluations and attendance tracking and to regularly distribute interesting cases or daily testing questions.”

In terms of Diagnosis Live and other audience response applications, Dr. Deshmukh believes the biggest limitation may be getting lecturers to change their format.

“Many non-digital-native teachers are not open to change, but once the initial hump is overcome, it gets easier,” he said. “We have entered the next frontier of digital medical education.”

Security Solutions for Mobile Technology

While mobile technology adds value to residency programs, institutions distributing mobile devices must use care in the way they access and handle patient data.

Indiana University employs a university-administered mobile device management (MDM) solution to safeguard confidential information, said Aaron P. Kamer, MD, assistant professor of radiology. Built-in protections offered by MDM solutions allow educators to focus on user and content management rather than software updates.

Dr. Kamer initially thought that device management software would be needed to maintain a HIPAA-compliant device. “Although we do use the MDM software to enforce having an encrypted, passcode-protected device, most modern medical apps (including our mobile PACS app) do not store patient data on the device itself. This provides an added layer of security that makes strict device management less of a concern,” Dr. Kamer said.

MDM solutions operate via a central server which communicates with the mobile devices. The server protects data on the tablets while delivering secure software updates and allows the university to provide links to frequently used sites and automatically set up the user's university email.

The extra security is critical to HIPAA compliance. Top-level MDM solutions isolate, or “containerize” confidential data from any non-compliant data, meaning that residents carrying hybrid work/personal devices are protected from crossover or leaks occurring between work and personal data stored on the device.



Image-guided Video-assisted Surgery Helps Remove Small Lung Masses

BY RICHARD DARGAN

A multi-disciplinary team at Brigham and Women's Hospital (BWH) that includes radiologists is demonstrating success with a new surgical procedure that combines video-assisted surgery with real-time imaging guidance to remove lung nodules while preserving healthy tissue.

While guidelines recommend surgical removal of lung nodules less than 2 centimeters in diameter that are suspicious for cancer, such removal presents a significant challenge for surgeons. Nodules located on pre-operative CT scans change position once the lung is partially collapsed for surgery.

"It's like taking one point inside an inflated balloon and trying to find it after you deflate the balloon," said Jayender Jagadeesan, PhD, a co-investigator of the clinical trial and a research scientist at the National Center for Image Guided Therapy (NCIGT), a National Institutes of Health (NIH)/National Institute of Biomedical Imaging and Bioengineering (NIBIB)-funded program at BWH and Harvard Medical School. The late Ferenc A. Jolesz, MD, served as principal investigator of NCIGT, which is now under the leadership of Clare Tempny, MD.

The surgeon can palpate the lung to find the nodule, but this method can be challenging with smaller nodules. As a result, surgeons can potentially remove large sections of healthy lung to ensure complete removal of the nodule.

"Thoracic surgery has evolved in the past decade toward minimally invasive surgery," said study co-author Ritu R. Gill, MD, MPH, an associate radiologist at BWH and an assistant professor of radiology, Harvard Medical School, director of thoracic imaging and intervention, AMIGO. "Patients are living longer and may have more than one tumor in their lifetime. Surgical techniques are evolving to optimize resection and not take out more viable lung than is needed."

WEB EXTRAS

Go to RSNA.org/News to:

- View a video of Stephen E. Seltzer, MD, chairman of the Department of Radiology at Brigham and Women's Hospital (BWH) and Michael J. Zinner, MD, chairman of the Department of Surgery at BWH, discussing the AMIGO Suite.
- View a video overview of the AMIGO Suite and a short simulation of the technology's capabilities.

This requires a multidisciplinary approach using intra-operative localization of lung nodules, allowing for targeted resection, decreasing operative times and morbidity."

Drs. Gill and Jagadeesan were part of a multidisciplinary BWH team that recently studied a new procedure — real-time image-guided video-assisted thoracic surgery (iVATS) — to ensure lung nodule removal.

The procedure involves positioning the patient for VATS in a hybrid operating room, imaging the patient in the surgical position after the patient has received general anesthesia, placing two T-bars on either side of the lesion, followed by surgical resection of the nodule along with the T-bars. A T-bar is an example of a fiducial, or an object that provides a frame of reference for image-guided procedures.

T-bars were approved by the U.S. Food and Drug Administration for a gastrointestinal procedure, but Raphael Bueno, MD, chief of thoracic surgery and associate director of the BWH Lung Research Center, decided to investigate whether T-bars would be an improvement over the wires and hooks traditionally used as fiducials in lung imaging.

"The problem with wires is that they are stiff and the lung is soft, so they tend to migrate," Dr. Bueno said. "T-bars are comprised of a metal tip attached to a thread, but they stay in place because the suture that holds them is flexible."

Trials Performed at AMIGO Suite

Before starting clinical trials for the new procedure, the BWH team traveled to Memphis, Tenn., to perform animal studies. Over the course of an entire day, the team tested all currently used fiducials and found that the T-bar was the most



Jagadeesan



Gill



Bueno

reliable option.

Armed with this knowledge, the team began a clinical trial at BWH's Advanced Multimodality Image Guided Operating (AMIGO) suite, a fully integrated operating suite offering immediate intra-procedural access to an extensive range of advanced imaging modalities. (See sidebar).

For the iVATS procedure, the radiologist uses the intraoperative scan in the operating room to help plan a route for placing the T-bars in the lungs. The radiologist and surgeon work very closely during this important part of the procedure.

"Because we are using imaging guidance, having a radiologist there makes it easier to identify the best approach to the nodule," Dr. Bueno said.

The radiologist and surgeon use a needle under C-arm CT imaging guidance to place T-bars adjacent to the nodule site while the patient's lungs are inflated. The goal is to mark the

location as accurately as possible for surgical resection so that the actual placement is not always the one used traditionally for needle biopsies.

After the lung is collapsed, the T-bars, which are connected to a suture, extend through the pleura into the collapsed lung. The surgeon then uses the rigid thoroscopic video camera to locate the nodule by finding the region where the sutures come out to the surface of the lung.

"The sutures act as surrogate markers for the tumor," Dr. Jagadeesan said.

After the nodule is removed, a specimen radiograph is obtained to make sure the T-bars and the nodule have also been included in the patient specimen before it is sent to pathology.

The BWH clinical trial included results from 24 consecutive patients with nodules



The AMIGO Suite at Brigham and Women's Hospital (above) allows multidisciplinary teams that include radiologists to collaborate and study new image-guided techniques for the diagnosis and treatment of many forms of cancer. Image courtesy of Jayender Jagadeesan, PhD, and Clare M.C. Tempany, MD.

ranging in diameter from 0.6 cm to 1.8 cm who enrolled. In several cases, the nodules had been discovered during low-dose CT screening.

iVATS Successful in Removing Lung Nodules

Results of the clinical trial, published last year in the *Journal of Surgical Oncology*, showed that the iVATS procedure was successful in removing the nodules in all patients and that the radiation dose was in the acceptable low range.

"These were not benign nodules," Dr. Bueno said. "Out of 23 nodules removed, 22 were actually cancers."

Along with preserving more of the healthy lung tissue, the iVATS procedure offers other benefits. The patient remains in the same room and in the same position throughout the procedure and only undergoes general anesthesia once. Operating room time is decreased, reducing risk of complications, and there is no migration of the fiducials.

"We now offer this procedure to patients as an optimal technique to remove small and ground glass and part-solid lung nodules," said Dr. Gill, who serves on the RSNA Quantitative Imaging Biomarker Alliance (QIBA) Lung Density Biomarker and CT Volumetry Committee.



On the cover: A surgeon performs the VATS procedure after placement of the T-bar in the AMIGO Suite.

The BWH team is tracking the progress of the patients treated during the study while planning a second trial to compare outcomes of patients who undergo iVATS with those who undergo standard video-assisted thoracic surgery.

Dr. Jagadeesan anticipates that iVATS will become more common as hybrid operating rooms, or rooms equipped with advanced imaging capabilities, continue to proliferate and more radiologists and surgeons are trained on the procedure.

In addition, small nodules are expected to become a much more frequent finding in the wake of recent recommendations for

routine lung cancer screening with low-dose CT in longtime smokers.

"Along with screening, we also needed to create downstream pathways to deal with nodules found incidentally on screening," Dr. Gill said.

Eventually, the thoroscopic video cameras and CT images could be fused together in what Dr. Jagadeesan called "augmented reality," providing the benefits of both views on one monitor.

"This was a great team effort, not only among different specialties but between an academic hospital and industry," Dr. Jagadeesan said.

Hybrid Operating Suite Expands Radiology's Reach

The iVATS procedure for lung nodule removal is just one example of the advances made possible by the Advanced Multimodality Image Guided Operating (AMIGO) Suite at Dana-Farber/Brigham and Women's Cancer Center in Boston. The 5,700-square-foot space includes three interconnected procedure rooms with real-time anatomic, functional and molecular imaging modalities, including MRI, PET/CT, CT-fluoroscopy and ultrasound.

The AMIGO Suite is directed by Clare M.C. Tempany, MD, the Ferenc Jolesz Chair of Radiology Research and principal investigator of the National Center for Image Guided Therapy, Brigham and Women's Hospital (BWH); Raphael Bueno, MD, chief of thoracic surgery and co-director of the BWH Lung Research Center, serves as associate director of the AMIGO Suite.

"With the AMIGO Suite, we can bring as much information to the surgeons as possible while they're performing

the surgery," said research scientist Jayender Jagadeesan, PhD, the technical lead for several of the procedures.

The suite allows multidisciplinary teams to collaborate and study new image-guided techniques for the diagnosis and treatment of many forms of cancer, including prostate, kidney, adrenal gland, bone, cervix, vagina and uterus. Specialists work together to plan and perform treatment without the patient or medical team ever leaving the operating room.

This innovative suite encourages collaboration among surgeons, interventional radiologists, imaging physicists, computer scientists, biomedical engineers, nurses and technologists.

As part of the National Institutes of Health-funded National Center for Image Guided Therapy, the AMIGO Suite serves as a national resource for all aspects of research into medical procedures enhanced by imaging.

For more information on the AMIGO Suite, go to www.brighamandwomens.org.

RSNA Resident and Fellow Committee Seeks New Ways to Engage Trainees

BY PAUL LATOUR

Finding new ways to foster a sense of community among RSNA trainee members was the key issue discussed during the RSNA Resident and Fellow Committee (RFC) meeting in May. The committee also discussed ways to use RSNA social media to reach out to trainees.

“Our members greatly value networking and opportunities to build life-long friendships with other trainees across the country,” said Nancy J. Benedetti, MD, the RFC chair and a neuroradiologist at Radiology Imaging Associates, Englewood, Colo., during the meeting held at RSNA headquarters in Oak Brook, Ill. “The RFC is brainstorming ways to increase trainee engagement and to foster a sense of community throughout the year.”

Networking will also be central to the RSNA 2016 Resident and Fellow Symposium, which will include a variety of sessions on career and professional development topics of interest to trainees. The symposium luncheon, held between the morning and afternoon symposium sessions, will bring together trainees and practicing radiologists.

This year’s symposium (See sidebar) will focus on a variety of issues including

“Our members greatly value networking and opportunities to build life-long friendships across the country. The RFC is brainstorming ways to increase trainee engagement and to foster that sense of community throughout the year.”

NANCY J. BENEDETTI, MD

financial planning, a topic of great interest to trainees.

“The millennial generation of doctors is working hard to empower themselves with the tools and knowledge for financial success,” Dr. Benedetti said. “The Resident and Fellow Symposium is one platform that RSNA uses to deliver content important to trainees, particularly career and financial planning topics that are not taught in most training programs.”

The committee also discussed how they could help trainees become and stay engaged with RSNA after they transition to the next stage of their radiology careers.

Engaging Trainees Through Social Media

RSNA has established a strong social media presence, spurred in large part by young radiologists and trainees as well as strong international participation. Nearly three times more people interacted with RSNA through social media during RSNA 2015 compared to the previous annual meeting, and RSNA social media content was viewed more than 5.8 million times across four platforms: Twitter, Facebook, LinkedIn and Instagram.

Throughout 2015, RSNA reached nearly 60,000 followers on Facebook and



The RSNA Resident and Fellow Committee (RFC), recently met at RSNA headquarters in Oak Brook, Ill., in May to discuss issues including social media, networking opportunities and progress of the first year of the RSNA Radiology Resident Representative (R²) program.

over 23,000 on Twitter. More than 60 percent of those followers are in the 25-44 age range.

The RFC would like residents and fellows to build on those numbers and help spread the word on topics of interest by liking, sharing or retweeting RSNA posts.

“We want to engage our trainees and use social media as a tool to disseminate useful information,” said Courtney M. Tomblinson, MD, RFC Social Media Subcommittee Chair and a radiology resident at the Mayo Clinic Hospital in Phoenix. “That could mean opportunities that are available through RSNA to make information readily available for such things as deadlines for abstracts, grant applications or trainee leadership opportunities.”

Dr. Tomblinson served as a Social Media Superuser member during a panel at the American Society of Neuroradiology annual meeting in May in Washington, D.C. She uses multiple social media platforms, but primarily uses Twitter as an educational tool by curating information and stimulating discussion within her future field of neuroradiology.

“There are so many options available to allow users to select a platform based on what they hope to achieve from it — each one has a somewhat unique reach and interaction,” Dr. Tomblinson said.

The committee also shared examples of content that would be of interest to their peers and discussed using social media tools such as Tweet chats and sharing content links and news stories.

“Social media is such a powerful platform for sharing knowledge and stimulating creative thinking, as well as for networking,” Dr. Tomblinson said. “As trainees, we are in this interesting position of trying to develop a professional presence by engaging in dynamic discussion of topics that will affect us soon after we leave training, and social media is a means for accomplishing that.”

R³ Program Going Strong After First Year

Reviews are positive after the first year of the RSNA Radiology Resident Representative (R³) program that serves as a bridge between RSNA and residents’ respective institutions.

The representatives serve as a local resource and point of contact to help educate residents about the full range of services and resources provided by RSNA and to encourage continuing involvement with RSNA both as trainees and beyond.

When the program was launched, the RFC emailed the 180 residency program directors across the U.S. asking them to nominate candidates. The response was impressive — 101 institutions joined the program.

“We have had excellent participation across the country,” said Daniel I. Glazer, MD, chair of the RFC Communications Subcommittee, as of July 1, a radiologist at Brigham and Women’s Hospital, director of abdominal and pelvic CT, and an instructor of radiology at Harvard Medical School, Boston. “Our next step is deciding the optimal way to utilize these representatives and how best to incorporate them into the overall communications strategy of the RFC. The goal is to continue increasing resident engagement and resident retention.”

Another initiative already implemented involved sending emails to R³s that highlight RSNA offerings geared toward trainees. Prior to last year’s RSNA annual meeting, the committee sent out information on resident-specific courses and details of the meeting, and also publicized the new trainee stipend available for accepted abstracts.

The committee considered other ideas for similar messaging, such as reminding residents of the study offerings available through *RadioGraphics* and the RSNA physics modules prior to the American Board of Radiology examinations.

Dr. Glazer said another benefit of the program is that information flows both ways.

“We can provide a lot of information about what RSNA has to offer, and we can then get a lot of feedback from individual R³s relating to anything we do. It’s a great resource,” he said.

Another round of emails was sent to the 180 program directors to solicit participants for the next year. As familiarity with the program grows, the number of participating institutions will grow in turn, Dr. Glazer said.



Benedetti




Tomblinson



Glazer

WEB EXTRAS

 To access the full roster of RSNA resources for trainees, go to RSNA.org/Trainees.

RSNA 2016 Resident and Fellow Symposium Topics Announced

The RSNA Resident and Fellow Symposium will be held Tuesday, Nov. 29, during RSNA 2016.

Attendees must be registered for RSNA 2016. Go to RSNA.org/Register.

Topics include:

Career 101: Contract Negotiation

- Academics — David Yousem, MD
- Private Practice — Raym Geis, MD
- Leadership Skills for Trainees — Jonathan Flug, MD

Career 102: Financial Planning

- Personal Financial Planning — Greg Wikelius, MD
- Insurance (Rad-to-Rad on Personal Finance) — David Feiler
- Physician’s Perspective — Amanda Liu, MD
- What RSNA Has to Offer Members-in-Training — Nancy J. Benedetti, MD

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Using preliminary data obtained with his 2012 Bayer HealthCare/RSNA Research Seed Grant, **Rony Avritscher, MD**, associate professor at the University of Texas MD Anderson Cancer Center, was recently granted an Individual Investigator Research Award of \$886,000 from the Cancer Prevention and Research Institute of Texas. Dr. Avritscher's project, "Imaging-based Quantitative Analysis of Vascular Perfusion and Tissue Oxygenation to Improve Therapy of Hepatocellular Carcinoma," will build on his RSNA research on the use of stem cells to enhance tumor destruction after radiofrequency ablation.

"Clearly, this achievement would not have been possible without RSNA's support. I am very grateful for the award and all the opportunities it has provided to my research team. I hope that this further demonstrates how much the Foundation's work benefits radiology research," Dr. Avritscher said.

RSNA Grant Recipients Develop Licensed PET Radiotracer



A low-molecular weight PSMA PET radiotracer, ¹⁸F-DCFPyL, was recently licensed by Progenics Pharmaceuticals, Inc. The agent will soon undergo clinical trials to determine its effectiveness for detecting metastatic prostate cancer.

The radiotracer was developed by Steve Y. Cho, MD, now at the University of Wisconsin-Madison. Dr. Cho received the 2008-2010 Bracco Diagnostics/RSNA Research Scholar Grant as an assistant professor at Johns Hopkins University. Working at Johns Hopkins with his mentor and 1996-1998 RSNA Research Scholar Grant recipient Martin G. Pomper, MD, PhD, Dr. Cho performed a first-in-man clinical translational study of a first-in-class, first-generation low-molecular weight PSMA PET radiotracer, ¹⁸F-DCFBC. That study paved the way for the improved second-generation agent.

"The RSNA Research Scholar Award, and other excellent resources through RSNA, have been invaluable to help me grow as an investigator and complete important initial proof of concept PSMA PET studies in prostate cancer," Dr. Cho said. "PSMA PET imaging will prove to be an important diagnostic tool in our fight against prostate cancer."

Radiology in Public Focus

A press release was sent to the medical news media for the following article appearing in a recent issue of *Radiology*.

Analysis of Workflow and Time to Treatment and the Effects on Outcome in Endovascular Treatment of Acute Ischemic Stroke: Results from the SWIFT PRIME Randomized Controlled Trial

Fast reperfusion leads to improved functional outcome among patients with acute stroke treated with stent retrievers. Detailed attention to workflow with iterative feedback and aggressive time goals may have contributed to efficient workflow environments, new research shows.

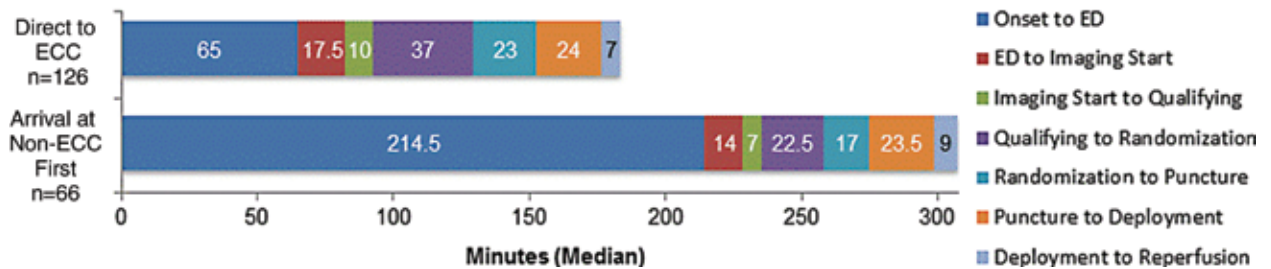
Mayank Goyal, MD, FRCPC, of the University of Calgary in Alberta, Canada, and colleagues analyzed data in the Solitaire with the Intention for Thrombectomy as Primary Endovascular Treatment for Acute Ischemic Stroke (SWIFT PRIME) trial. Specifically, researchers examined data in which outcomes were compared in patients treated with intravenous tissue plasminogen activator (t-PA) alone or in combination with the Solitaire device.

Researchers determined:

- Revascularization within 2 ½ hours of symptom onset was associated with functional independence (minimal or no disability) in 91 percent of patients.

- Likelihood of functional independence was 10 percent higher in patients treated within 2 ½ hours compared with patients treated between 2 ½ and 3 ½ hours after stroke onset.
- Every 60-minute delay after 3 ½ hours resulted in a 20 percent lower likelihood of functional independence.
- Upon arrival to the emergency department, sources of delay from imaging acquisition, delivery of patient to the angiography suite, and reperfusion can all be decreased with streamlined workflow.

“Detailed analysis of the workflow in the SWIFT PRIME trial provides further data on the importance of time and efficiency in acute ischemic stroke management, likely contributing to the superior clinical outcome observed in the intervention arm of the trial,” the authors write.



Graph of time intervals in patients treated within the same institution, an endovascular-capable center (ECC), versus those who were transferred from another facility after receiving intravenous t-PA therapy. Deployment = device deployment, puncture = groin puncture, qualifying = qualifying image acquisition.

(*Radiology* 2016;279:3:888-897) ©RSNA 2016 All rights reserved. Printed with permission.

New on *RadiologyInfo.org*

Visit *RadiologyInfo.org*, the public information website produced by the RSNA and ACR, to read new content posted to the site on Dementia and Venous Sampling.



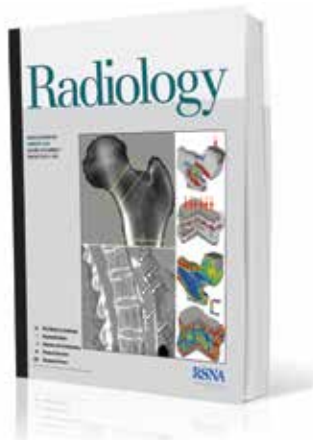
July Public Information Outreach Activities Focus on Fatty Liver Disease

In July, RSNA's 60-Second Checkup radio program will focus on the link between obesity and fatty liver disease as well as current screening methods for the condition. The segments will be distributed to radio stations across the country.

Media Coverage of RSNA

In March, 1,071 RSNA-related news stories were tracked in the media. These stories reached an estimated 887 million people.

Coverage included *U.S. News & World Report*, Yahoo! Finance, *Bloomberg News*, *Philly.com*, *Newsweek*, *MSN.com*, *San Francisco Chronicle*, *Boston.com*, *CNBC.com*, *The Daily Mirror* (UK), *Science Daily*, *Medical News Today*, *Health Imaging & IT* and *Auntminnie.com*.



Connect with *RadiologyInfo.org* on Social Media

Have you connected with *RadiologyInfo.org* on Facebook, Twitter or YouTube? Get the latest information and news to share with your patients by liking [Facebook.com/RadiologyInfo](https://www.facebook.com/RadiologyInfo) and following [Twitter.com/RadiologyInfo](https://twitter.com/RadiologyInfo).

Access patient education videos describing various radiology procedures at [YouTube.com/Radiologyinfodotorg](https://www.youtube.com/Radiologyinfodotorg).



Residents & Fellows Corner

RadioGraphics Offers ABR Core Exam Study Guide

Access the *RadioGraphics* American Board of Radiology (ABR) Diagnostic Radiology Core Exam Study Guide Article Index for help in preparing for the ABR Diagnostic Radiology Core Exams at RSNA.org/RadioGraphics. In 2016, ABR exams are scheduled for October and November. For more information on the ABR exam, go to theabr.org.

RadioGraphics

The Value of Membership

RSNA Weekly Keeps Members Abreast of Current Radiology-related News

RSNA Weekly, a weekly briefing on news affecting the radiology profession, is a free RSNA member benefit.

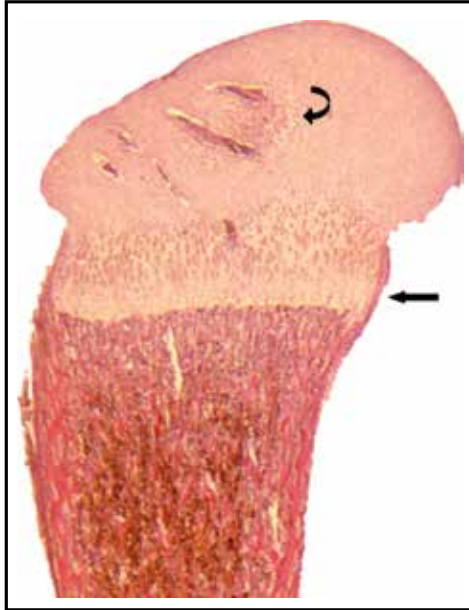
Each Tuesday, *RSNA Weekly* is delivered directly to members by email. It provides a compendium of current news related to radiology and clinical practice from a wide array of news sources, both domestic and international.

One purpose of *RSNA Weekly* is to make RSNA members aware of what their patients, fellow physicians and allied professionals are reading. If you are not receiving this valuable news summary, go to the Membership Page on RSNA.org, click My Accounts, scroll to E-News Subscriptions and select *RSNA Weekly*.



Journal Highlights

The following are highlights from the current issues of RSNA's two peer-reviewed journals.



Longitudinal histologic section of a developing proximal femur from a third-trimester fetus illustrating from superior to inferior cartilaginous epiphysis with developing secondary ossification center of the femoral head (curved arrow), the entire growth plate (straight arrow), and the metaphysis and proximal diaphysis containing the primary ossification center (Hematoxylin-eosin stain, low magnification).

(*Radiology* 2016;280;1:InPress) ©RSNA 2016 All rights reserved. Printed with permission.

Acute and Stress-related Injuries of Bone and Cartilage: Pertinent Anatomy, Basic Biomechanics, and Imaging Perspective

Knowledge of the macroscopic and microscopic anatomy and basic biomechanics of bone and cartilage provides the foundation for a better understanding of the manner in which this tissue responds to altered mechanical forces and sheds light on the imaging appearances associated with both acute and repetitive injury.

In a State-of-the-Art article in the July issue of *Radiology* (RSNA.org/Radiology), Mini N. Pathria, MD, and Christine B. Chung, MD, of the University of California San Diego (UCSD) Medical Center, and Donald L. Resnick, MD, of the UCSD Teleradiology and Education Center, review the embryology and macroscopic and microscopic anatomy. Researchers also address basic biomechanical principles that explain the patterns of failure occurring in the cartilage, subchondral bone plate, and cortical and cancellous bone that are encountered clinically.

"Thorough knowledge of the anatomy, physiology and biomechanics of normal bone and cartilage serves as a prerequisite to a full understanding of both the manner in which these tissues adapt to physiologic stresses and the patterns of tissue failure that develop under abnormal conditions," the authors write.

Radiology

This article meets the criteria for AMA PRA Category 1 Credit™. SA-CME is available online only.

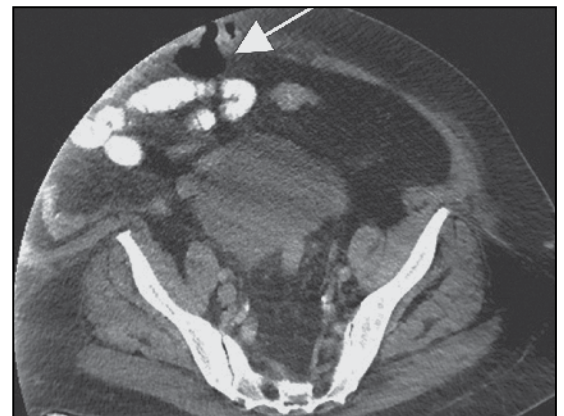
Bariatric CT Imaging: Challenges and Solutions

The obesity epidemic in the adult and pediatric populations affects all aspects of healthcare, including diagnostic imaging.

In an article published in the July-August issue of *RadioGraphics* (RSNA.org/RadioGraphics) Dmitry M. Fursevich, MD, of Florida Hospital in Orlando, and colleagues explain the physical limitations to accommodating bariatric patients in CT suites, describe commonly encountered CT artifacts at bariatric imaging, and discuss the pitfalls in acquiring contrast-enhanced CT images of bariatric patients.

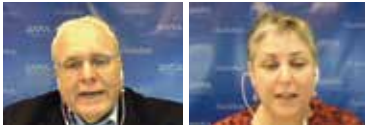
RadioGraphics "With the increasing prevalence of obese and morbidly obese patients, bariatric CT imaging is becoming common in day-to-day radiology practice, and a basic understanding of the unique problems that bariatric patients pose to the imaging community is crucial in any setting," the authors write.

This article meets the criteria for AMA PRA Category 1 Credit™. SA-CME is available online only.



Axial CT image of a morbidly obese 75-year-old woman shows the cropping artifact. Subcutaneous soft tissues and the right abdominal wall were excluded from the reconstruction field of view. A ventral hernia (arrow) at the periphery of the image was nearly missed.

(*RadioGraphics* 2016;36;InPress) ©RSNA 2016 All rights reserved. Printed with permission.



Listen to *Radiology* Editor Herbert Y. Kressel, MD, deputy editors and authors discuss the following articles in the May issue of *Radiology* at RSNA.org/Radiology-Podcasts.

- “Association between Hepatic Triglyceride Content and Left Ventricular Diastolic Function in a Population-based Cohort: The Netherlands Epidemiology of Obesity Study,” Ralph L. Widya, MD, and colleagues.
- “Indirect Cost and Harm Attributable to Oral 13-Hour Inpatient Corticosteroid Prophylaxis before Contrast-enhanced CT,” Matthew S. Davenport, MD, and colleagues.
- “White Matter Degeneration with Aging: Longitudinal Diffusion MR Imaging Analysis,” Marius de Groot, MSC, and colleagues.

Education and Funding Opportunities

RSNA’s Online Education Tools Put CME at Your Fingertips

A full library of RSNA educational tools makes it easy for members to earn CME, track credits and report progress. Highlights of online resources include:

Earn SA-CME Online

With a robust catalog of more than 600 SA-CME offerings, RSNA’s eLearn Online Library (RSNA.org/Library) offers members and non-members the opportunity to earn CME credits in major subspecialty areas. Members can access RSNA’s online education for free.

During the interactive tests, users can enlarge images with a single click, reference articles and receive instant feedback with immediate explanations to test responses. RSNA’s online education is also tablet-optimized. All of RSNA’s online CME activities can be applied toward the American Board of Radiology’s MOC Self-Assessment CME requirements.

Track RSNA-earned CME Credit

Track earned credits toward MOC requirements at RSNA.org/Track-My-CME. Each time an RSNA CME activity is completed, it will be automatically documented in the RSNA CME Repository, a centralized storage location for all RSNA-earned CME credits, including online education, in-person workshops and annual meetings.



The Self-entered Credits tool allows members to document their self-guided learning experiences and CME earned from non-RSNA activities. Each entered record will be added to the member’s personalized, self-entered list of CME in the CMD Repository.

Access RSNA Credit Records Through CME Repository

RSNA members can use the CME Repository to access and download credit records, filtering information by date, specific activity or subspecialty-modality. After entering search parameters, users will gain access to a robust cumulative record of CME credit, detailing the courses with the relevant subspecialty designation for each activity.

Access Credits from Multiple Organizations with the CME Gateway

The CME Gateway makes tracking credits from multiple organizations simple and easy. Administered by RSNA, this free tool helps radiologists track their earned CME credits from multiple organizations in one centralized location.

CME Gateway does not store credit — it references credit from various organization credit tracking systems (e.g. the RSNA CME Repository). Credits from the CME Repository are displayed in the CME Gateway only when the user chooses to “opt in” to RSNA from his or her Gateway account. Along with a Gateway account, the user must have active membership in the related credit organization.

Visit cmegateway.org to sign up and begin tracking CME credits.



FINAL CALL FOR APPLICATIONS

RSNA Advanced Course in Grant Writing

Deadline for Application
July 1, 2016

Applications are being accepted for this course designed to assist participants — generally junior faculty members in radiology, radiation oncology or nuclear medicine programs — prepare and submit a National Institutes of Health, National Sciences Foundation, or equivalent grant application. The course, held at RSNA Headquarters in Oak Brook, Ill., will consist of four 1½-day sessions.

- Session I: Sept. 23-24, 2016
- Session II: Oct. 28-29, 2016
- Session III: Jan. 27-28, 2017
- Session IV: April 7-8, 2017

Accepted participants are responsible for travel expenses for each session. Hotel accommodations will be provided by RSNA. There is no fee for this course. For more information and to download an application, go to RSNA.org/AGW.

FINAL CALL FOR APPLICATIONS

Introduction to Academic Radiology for Scientists (ITARSc)

Deadline for Application
July 1, 2016

Postdoctoral fellows in imaging sciences and biomedical engineering who received their degrees within the past six years are invited to apply for the opportunity to participate in this dynamic program held during the RSNA annual meeting in Chicago, Nov. 27-Dec. 1, 2016.

The program consists of a combination of dedicated programming for ITARSc participants, and shared sessions with participants of the Introduction to Academic Radiology (ITAR) program.

Accepted participants are responsible for all travel expenses and hotel accommodations and will receive a \$1,000 stipend to offset travel and hotel costs as well as free registration for the RSNA annual meeting. There is no fee for this course.

Application/nomination forms are available at RSNA.org/ITARSc.

Questions about these programs can be directed to dor@RSNA.org or Rachel Nelson at 1-630-368-3742.

FINAL CALL FOR APPLICATIONS

RSNA/AUR/ARRS Introduction to Academic Radiology Program

Nominations/application deadline:
July 15, 2016



Sponsored by RSNA, the American Roentgen Ray Society (ARRS) and the Association of University Radiologist (AUR), the Introduction to Academic Radiology program:

- Exposes second-year residents to academic radiology
- Demonstrates the importance of research in diagnostic radiology
- Illustrates the excitement of research careers
- Introduces residents to successful clinical radiology researchers

Successful applicants will be assigned to either a seminar held during the RSNA annual meeting in Chicago, Nov. 27 to Dec. 1, 2016 or the ARRS annual meeting in New Orleans from April 30 to May 5, 2017.

A \$1,000 award will be made to the departments of accepted applicants to be used to help advance the applicant's academic career. Accepted participants are responsible for all travel expenses and hotel accommodations. There are no fees associated with this course. For more information and to download an application/nomination form, go to RSNA.org/ITAR.

Annual Meeting Watch




News about RSNA 2016

Advance Registration and Housing is Now Open

Register online at RSNA.org/Register.

The three official housing providers for RSNA are only Experient, E.S.A. Voyages and ACE Marketing; no other companies are authorized by RSNA. Do not risk your credit card or hotel reservation — unauthorized hotel solicitors may result in unfortunate and expensive consequences.

Reserve your hotel room with RSNA's official housing partners:

- Experient is the official housing provider for the RSNA annual meeting. For more information visit RSNA.org/Register or email reginfo@rsna.org. 
- E.S.A. Voyages is the official international travel partner for groups, providing a variety of international travel packages including airfare and hotel. For more information, contact esa@esavoyages.fr. 
- ACE is the official travel partner for groups coming from China and Taiwan, providing travel and hotel packages. For more information, contact stephaniezhu@acemarketing.com.cn. 

Secure your reservations early for the best selection and access to these great benefits:

- **Discounted Rates:** More than 90 Chicago hotels offer varying price points to meet your budget.
- **Flexible Booking Terms:** We offer a 72-hour cancellation policy.
- **Real-time Reservations:** Book now and receive an immediate confirmation.
- **Customer Service:** RSNA works on your behalf to resolve hotel disputes and assist with housing questions or concerns.
- **Support RSNA:** Booking through RSNA allows the Society to negotiate the best deals for you.
- **Free Transportation:** Shuttle bus and Metra train service between all RSNA-contracted hotels and McCormick Place is free.

Direct your housing questions to housing@rsna.org, or 1-630-571-7847.



RSNA® 2016

Important Dates for RSNA 2016

- July 27 RSNA Online Program Opens
- Oct. 1 Deadline for Badge Mailing*
- Nov. 4 Final Discounted Registration Fee and Housing Deadline at 5 p.m. Central Time (CT)
- Nov. 5 Increased Registration Fee Applied, \$150 for most categories
- Nov. 27 - Dec 2 102nd Scientific Assembly & Annual Meeting
- Dec 23 Virtual Meeting closes

* **NEW FOR 2016** Badge materials will be mailed to all professional attendees registered by Oct. 1. For registrations processed after Oct. 1, badges will be available for pickup at McCormick Place

Registration Fees - On or Before Nov. 4 - fees increase \$150 after Nov. 4 for most categories

ANNUAL + VIRTUAL MEETING PACKAGE *	ANNUAL MEETING ONLY	VIRTUAL MEETING ONLY	
\$100	Free	\$100	RSNA/AAPM Member
\$25	Free	\$25	RSNA Member-in-Training, RSNA Student Member
\$300	Free	\$300	Non-Member Student
\$500	\$200	\$300	Non-Member Resident/Trainee
\$500	\$200	\$300	Radiology Support Personnel
\$1200	\$900	\$300	Non-Member Physician/Physicist
\$1200	\$900	\$300	Hospital or Facility Executive and Industry Personnel
\$625	\$325	\$300	One-day Technical Exhibits Only

*Register for the RSNA Annual + Virtual Meeting Package and get access to both the physical meeting at McCormick Place and the Virtual Meeting. This package gives you the maximum flexibility by providing access to selected live-streamed and on-demand sessions, scientific presentations, education exhibits and Cases of the Day. The meeting is available on demand until Dec. 23 at 4 p.m. CT.

For more information about registering for RSNA 2016, visit RSNA.org/Register, email reginfo@rsna.org, or call 1-800-381-6660 or 1-630-571-2670 x7862.

Annual Meeting Watch



5k Fun Run

6:30 a.m., Tuesday, Nov. 29
Arvey Field, South Grant Park, Chicago



Join the RSNA 2016 5k Fun Run and support radiology research and education with proceeds benefiting the RSNA Research & Education (R&E) Foundation. Whether you run, jog or walk, enjoy an outing for a good cause and network with your colleagues along Chicago's beautiful Lake Michigan shoreline.

Your fully tax-deductible donation benefits the RSNA R&E Foundation. Participants receive a commemorative T-shirt, while supplies last. Sign up during meeting registration at RSNA.org/Register.

Please note, in case of inclement weather, the Fun Run may be canceled. All Fun Run fees are non-refundable and non-transferable.

High Impact Clinical Trial Session Will Debut at RSNA 2016

For the first time, RSNA 2016 will host a High Impact Clinical Trial (HICT) session featuring the latest cutting-edge clinical science and research. This session will provide a forum for practice-changing clinical research across radiology with the goal to present the most significant work in the field. The session will be co-sponsored by RSNA's journal *Radiology*.

RSNA® 2016

Each accepted abstract may be considered for simultaneous online publication in *Radiology*. A draft of the manuscript is needed by Sept. 12 to allow for rapid review.

Submissions should be presentations of the primary endpoint(s) of a trial; of new data or secondary analyses of a trial where the primary data has been presented previously; a new registry or new data/analyses from a registry; or the latest and "hottest" findings in translational imaging sciences that have immediate clinical implications.

Abstract submissions are underway. Deadline for submissions is Aug. 1 at noon Central time. Authors of accepted submissions will be notified Aug. 15. For more information go to RSNA.org/AnnualMeeting.

Experience RSNA 2016 through the Virtual Meeting

With the vast offerings RSNA 2016 provides, take advantage of this opportunity to enjoy additional programming during and after the meeting. Add the Virtual Meeting to your registration package to access select live-streamed and on-demand sessions, scientific presentations, education exhibits and Cases of the Day. The Virtual Meeting is available on demand until Dec. 23 at 4 p.m. Central time. Earn CME for select sessions.



RSNA Career Connect – Linking Radiology Professionals to Open Positions

Visit the newly enhanced RSNA Career Connect webpage to search for the perfect fellowship or employment opportunity.

Job and Fellowship Seekers:

- Search postings or create a search agent to receive email notifications as positions become available
- Search filters — Search positions by keyword, location and specialty
- Post your resume — Allow potential employers to view your job experience

Employers:

- Post career opportunities and attract highly qualified candidates
- Post radiology fellowships
- Use optional posting enhancements such as digital job videos or featured job add-ons to give listings more exposure



Visit the Career Connect page at RSNA.org/Careers.

For Your Calendar

JULY 31 – AUG. 3

Association for Medical Imaging Management (AHRA)
Nashville, Tennessee
Visit the RSNA Booth
• AHRAonline.org

AUG. 19-21

Asian Oceanian Society of Radiology (AOSR)
Beijing, China
Visit the RSNA Booth
• TheAOSR.org

SEPT. 8-10

Interamerican College of Radiology (CIR)
Lima, Peru
Visit the RSNA Booth
• WebCIR.org

FIND MORE EVENTS AT RSNA.org/Calendar.aspx.

COMING
NEXT
MONTH

In August, *RSNA News* takes a closer look at a patient- and family-centered care program at the University of Michigan Health System and why quality is the key to patient experience and value.

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