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3D and 4D Fetal Ultrasound Advances Spark Research, Create Challenges

ALSO INSIDE:

- Redesigning Reading Room Helps Combat Ergonomic Injuries
- Residents Gain Critical Experience Through Academic Research Program
- Quantitative Imaging Poised to Realize Full Potential in Cancer Research
- Technical Challenges Hinder Use of Adrenal Vein Sampling

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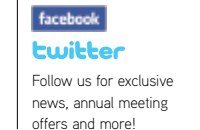
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To Be Announced



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AUR, APDR Bestow Honors

The Association of University Radiologists (AUR) and the Association of Program Directors in Radiology (APDR) honored esteemed members at the AUR 61st Annual Meeting in Los Angeles.

AUR awarded its gold medal to **Ronald L. Arenson, M.D.**, the Alexander R. Margulis Distinguished Professor and chair of the Department of Radiology and Biomedical Imaging at the University of California San Francisco. Dr. Arenson has served on numerous RSNA committees and is currently chairman of the RSNA Board of Directors.

APDR awarded **Michael J. Shortsleeve, M.D.**, the Achievement Award. Dr. Shortsleeve is chair of the Department of Radiology and director of radiography service at the Mount Auburn Hospital in Cambridge, Mass., and a clinical assistant professor in radiology at Harvard Medical School.



Arenson

Shortsleeve

National Strategy for Appropriate Medical Imaging Focus of ABRF Summit

A diverse array of stakeholders gathered to discuss a national strategy for safe and appropriate medical imaging at the American Board of Radiology Foundation's (ABRF's) fourth national summit, "Safe and Appropriate Imaging: Partnership for a Patient-Centered Approach," held in March in Bethesda, Md.

ABRF is a public/private/professional partnership whose mission is to demonstrate, enhance and continuously improve accountability to the public in the use of medical imaging and radiation therapy.

The March summit advanced the work of the foundation's August 2012 summit in which leaders identified several current

quality and safety gaps in medical imaging and described attributes of an optimized medical imaging system. Attendees of the March summit began jointly developing a national strategy and creating solutions that address those gaps.

According to Glenn S. Forbes, M.D., chair of the ABRF Board of Directors, "During and between the summits, the ABRF convenes representatives from five domains—healthcare providers, regulatory agencies, payors, equipment manufacturers, and the public/patients—and facilitates a diverse, inclusive, collaborative effort to define and optimize the pathway to safe and appropriate medical imaging.

"The unique nature of this assembly is the all-inclusive and diverse representation of the participants," Dr. Forbes said. "Leadership from all large national entities representing effort in medical imaging were invited and responded for participation. A common agreement has been made to not represent constituent interests, but rather, to focus solely on the needs of the patient and improvement for the public good."

Learn more about ABRF at www.abrfoundation.org or contact abrfoundation@abrfoundation.org.

Numbers in the News

5-7

Number of years before a mature quantitative imaging methodology is expected to be established for predicting and/or measuring tumor response to therapies in clinical trial settings. [Read more on Page 11.](#)

16

The number of years the Mayo Clinic refrained from performing adrenal vein sampling (AVS) before resuming the procedure in 1990. [Read more about the interventional procedure that is underutilized despite its diagnostic accuracy on Page 13.](#)

500

Estimated cost in dollars of a sound-masking system for an approximately 500-square-foot radiology reading room, which can decrease associated distractions. [Read more about other ergonomics solutions for the radiology reading room on Page 5.](#)

15,000

Approximate number of fans on RSNA's Facebook Page, one of the social media tools that keep members updated on all things RSNA. [Read more about accessing these tools from RSNA.org on Page 24.](#)



Castañeda-Zuniga

Kumpe

Thomson

SIR Bestows 2013 Gold Medals

The Society of Interventional Radiology (SIR) recently presented gold medals at its annual meeting in New Orleans:

Wilfrido R. Castañeda-Zuniga, M.D., is an emeritus professor of radiology at Louisiana State University School of Medicine and professor of radiology at University of Minnesota Medical School and University of Texas School of Medicine at San Antonio.

David A. Kumpe, M.D., is the director of interventional neuroradiology and a professor of radiology, neurosurgery and surgery at the University of Colorado Hospital.

Kenneth R. Thomson, M.D., is a professor and director of radiology at the Alfred Hospital in Melbourne, Australia.

Stern Receives SMRI Academic Excellence Award

The Mexican Society of Radiology and Imaging (SMRI) awarded its Academic Excellence Award to **Eric J. Stern, M.D.**, during the society's recent annual meeting in Mexico City. Dr. Stern is a professor of radiology, adjunct professor of medicine, medical education and bioinformatics, and global health and vice-chair, academic affairs at the University of Washington in Seattle.



Jadvar Named ACNM President

The American College of Nuclear Medicine named **Hossein Jadvar, M.D., Ph.D., M.P.H., M.B.A.**, president for 2013-14. Dr. Jadvar is an associate professor of radiology biomedical engineering and the vice-chair of research at the University of Southern California Keck School of Medicine in Los Angeles. Dr. Jadvar is a past recipient of an RSNA Research & Education (R&E) Foundation Research Seed Grant.



American Board of Radiology Elects New Trustees

The American Board of Radiology (ABR) has elected **Stephen M. Hahn, M.D.**, as a trustee for radiation oncology and **J. Anthony Seibert, Ph.D.**, as a trustee for medical physics, both effective July 1. Dr. Hahn is chair and Henry K. Pancoast professor of radiation oncology at the University of Pennsylvania. Dr. Seibert has been a professor of radiology and medical physics at the University of California Davis Medical Center since January 1983 and is currently associate chair of radiology informatics.



Seibert

Hahn

SAR Bestows Honors

The Society of Abdominal Radiology (SAR) awarded its 2013 Walter B. Cannon Medal to RSNA Liaison for International Affairs, **Richard L. Baron, M.D.**, at its recent annual meeting. Dr. Baron is dean for clinical practice and a professor of radiology at the University of Chicago Medical Center where he has served as chair of radiology for nine years. **Richard L. Clark, M.D.**, an emeritus professor of radiology at the University of North Carolina School of Medicine in Chapel Hill, was awarded the 2013 Howard M. Pollack Medal.

Suresh K. Patel, M.D., an attending physician in the department of radiology at Northwestern Memorial Hospital in Chicago, and Ali Shirkhoda, M.D., a clinical professor of radiology at the University of California School of Medicine at Irvine, were respectively awarded the GU and GI Lifetime Achievement Awards.



RSNA Board Liaison for International Affairs **Richard L. Baron, M.D. (left)**, receives the Society of Abdominal Radiology (SAR) 2013 Walter B. Cannon Medal from SAR president **Stuart G. Silverman, M.D. (right)**.

IN MEMORIAM

Philip E.S. Palmer, M.D.

Philip E.S. Palmer, M.D., a pioneer in promoting the use of radiology and radiation therapy in Africa and developing countries, died January 3, 2013. He was 91.

Dr. Palmer was an emeritus professor of radiology at the School of Medicine at the University of California (UC) Davis in Sacramento. He joined the staff in 1970 as the first radiology department chair and spent the next 20 years of his professional career there, also serving as director of diagnostic radiology at the UC Davis Medical Center.

Prior to joining UC Davis, Dr. Palmer worked in Southern Rhodesia (now Zimbabwe) to introduce the use of new techniques in diagnostic radiology, including neuroradiology and angiography, and radiotherapy for cancer patients in the region. He also chaired the radiology department at the University of Cape Town in South Africa.

After retiring from UC Davis in 1990, Dr. Palmer spent 30 years as a consultant for the World Health Organization in Geneva and led a modernization of radiologic education and practices in Romania following the end of communism.

Dr. Palmer received the Roentgen Medal from the German Radiological Society in 1993. He received the first Bécclère Medal, the highest award of the International Society of Radiology, and gave the first Bécclère Lecture in 1996. Dr. Palmer served as RSNA second vice-president in 1994 and received the RSNA Special Presidential Award in 2000.



IN MEMORIAM

Marian Godiksen Schuyler

Marian Godiksen Schuyler, who served as RSNA interim executive director from 1988 to 1989 prior to her retirement, died January 11, 2013. She was 82.

In the 1990s Schuyler worked side-by-side at RSNA with her husband George Schuyler, director of scientific meetings. He was presented with an RSNA Gold Medal at the 1988 Scientific Assembly for his accomplishments, specifically his assistance in moving the annual meeting from Chicago's Palmer House to McCormick Place.

During her career, Schuyler worked in various capacities for the Central Intelligence Agency (CIA), ending her career there in covert operations. While working at the CIA, she attended evening classes to complete her first year of law school. In the mid-1960s, Schuyler worked with the Inner-City Teaching Corps, an elite group of future leaders working to close the achievement gap in Chicago's urban schools.

My Turn

Ergonomics is an Investment in Yourself—and Your Patients

In medical school we are introduced to the Physician's Oath—"The health of my patients will be my number one consideration." Our own health, however, becomes secondary as late-night studying turns into a routine of work, sleep deprivation and stress during advanced medical training.

Many of us work in environments that are uncomfortable at best, unsafe at worst, while ignoring warning signs of problems that can damage our bodies and minds. Radiology trainees learn little about the science of ergonomics that is so critical to ensuring comfort and safety while maximizing productivity.

At the Baltimore Veterans Affairs (VA) Medical Center, creating our "Radiology Reading Room of the Future" provided insights into improving ergonomics:

- Lighting should be incandescent and indirect. Ambient lighting should approximate monitor brightness. Project a blue background light behind the workstation to reduce perceived stress.
- Monitor brightness is as important as resolution. DICOM grayscale calibration can decrease the need to perform window/leveling.
- Sound can be critical to improving concentration and decreasing stress. A sound-masking system is a "best buy" investment.

- Workstations should accommodate sitting or standing while dictating. Try out a new chair for at least a week, with varying combinations of armrest, height, tilt and other parameters.
- Interfaces such as the mouse are increasingly associated with repetitive stress injuries. Touchscreen and voice recognition may ultimately resolve this; for now, consider alternative handheld solutions.
- Environmental controls such as custom ventilation and heating can improve comfort and productivity.
- Personalize your workspace. In addition, stay well hydrated and undergo annual vision examinations for near, medium and distance viewing.
- Innovate and be creative. We have experimented with a viewing station on a treadmill, a reclining "dental" chair and angled monitor and other futuristic high-tech solutions.

- Smile: Find something to laugh or at least smile about every 20 minutes for 20 seconds.
- Think Green: Consider turning your monitors and workstations off at the end of the day. It can save a considerable amount of energy and money.

Investing time, money and effort to improve your work environment will pay for itself. These changes are not merely for the comfort of the radiologist—per the Physician's Oath, they are investments for our patients.

Eliot Siegel, M.D., is professor and vice-chair of Information Systems, Department of Radiology and Nuclear Medicine, the University of Maryland, and chief of imaging at the Veterans Affairs (VA) Maryland Healthcare System, both in Baltimore.

Read more about radiology ergonomics in, "Redesigning Reading Room Helps Combat Ergonomic Injuries," on Page 5.



THIS MONTH IN THE RSNA NEWS TABLET

Get more of this month's news with the *RSNA News* Tablet edition, available for download through the App Store and Google Play.

May features a video interview with Laurence Clarke, Ph.D., discussing the role of quantitative imaging in cancer as a means of predicting and measuring response to cancer therapy and a video of the 3D fetal ultrasound technology that offers researchers more detailed views of the fetus and parents a glimpse of their baby.

Access the *RSNA News* tablet edition on the App Store at itunes.apple.com/us/app/rsna-news/id444083170?mt=8 and Google Play at <https://play.google.com/store/apps/details?id=air.org.rsna.rsna-news&hl=en>.



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Redesigning Reading Room Helps Combat Ergonomic Injuries

Radiologists transitioning from film-based to digital reading rooms are experiencing a host of new workplace maladies ranging from neck and back problems to repetitive motion disorders like carpal tunnel syndrome.

ALTHOUGH not always accessed, ergonomic solutions that will not only reduce injuries but also maximize productivity are simple and often easy to implement, according to Eliot Siegel, M.D., chief of imaging at the Veterans Affairs (VA) Maryland Healthcare System in Baltimore, one of the nation's first filmless healthcare facilities. Dr. Siegel, who spearheaded "The Reading Room of the Future" project at the Baltimore VA, presented findings from the project at RSNA 2012.

"Ergonomics is a topic that has not received anywhere near the attention that it should," said Dr. Siegel, also professor and vice-chair of Information Systems, Department of Radiology and Nuclear Medicine, the University of Maryland, Baltimore. "A relatively small amount of effort reaps huge benefits. It is an investment in an area where radiologists spend much of their time."

Through trial and error, Dr. Siegel and colleagues discovered that redesigning the entire reading room is vastly more effective than simply adding computerized workstations to the previous film-based environment. Initially a single, unpartitioned space, the Baltimore VA reading room now features areas where radiologists can work independently and others where they can collaborate when necessary.

"In a digital environment where we are interacting with computer workstations, it is really critical to rethink the entire design of the room in terms of lighting, sound, temperature and other elements," Dr. Siegel said. "Some factors that were less important in a film-based environment become extraordinarily important in this new digital environment."

For example, lighting is a key to improving the overall radiology work environment in a digital workspace. Because overhead fluorescent lighting cannot be adjusted for brightness and often flickers and causes glare, Dr. Siegel switched to indirect, incandescent lighting which helped reduce physician eye strain. In addition, using a blue light behind the workstations decreases radiologists' stress level while increasing visual acuity, the team discovered.

"It is a very calming and relaxing environment," Dr. Siegel said. "In fact, it is so relaxing we've had clinicians and visitors say that they would love to take a quick nap in the low-stress environment."

If a facility can make only one change, Dr. Siegel recommends implementing a sound-masking system. At the Baltimore VA, the system emits a

constant sound at a frequency close to human speech, which helps minimize noise distractions from the lobby and MR imaging scanner, both which are immediately adjacent to the reading room. Although the ideal reading room includes sound-proofed walls to eliminate ambient noise, the sound-masking system is a more affordable option.

"We found that just using the sound-masking system, which costs about \$500 for an approximately 500-square-foot room, can significantly decrease distractions associated with noise in and outside the room," Dr. Siegel said. "In our experience it has been effective, and it can even increase the accuracy of the speech-recognition systems being used now."

Because controlling temperature and ventilation is also critical and can impact productivity, the facility's new reading rooms have a subset of workstations equipped with individual controls for each user, Dr. Siegel said.

"Many of us work in environments where the air doesn't move much and gets stale," Dr. Siegel said. "Nobody would drive a car where they didn't have air blowing or couldn't control the temperature, but how many radiologists will sit in a room for 8 or 10 hours without being able to easily adjust the temperature or ventilation?"

Ergonomics Checklist Helps Prevent Injuries

A surge in such work-related complaints from radiologists led researchers at Cornell University in Ithaca, N.Y., to develop the Cornell Digital Reading Room Ergonomics Checklist in 2006

“Some factors that were less important in a film-based environment become extraordinarily important in this new digital environment.”

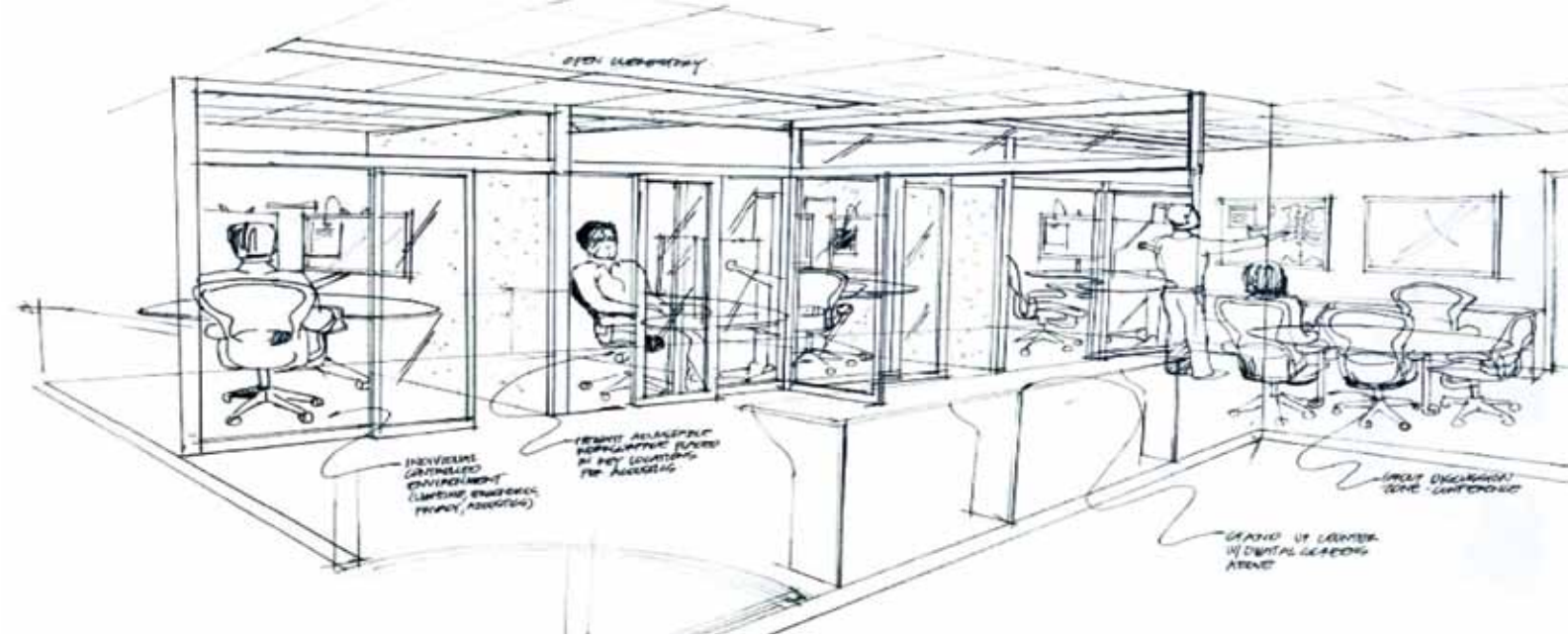
Eliot Siegel, M.D.



Siegel



Hedge



Experts from across the country created a charette, or design, (above) of an ergonomically optimized and low-stress clinical reading room at Veterans Affairs (VA) Maryland Healthcare System in Baltimore, one of the nation's first filmless healthcare facilities.

Image courtesy of Eliot Siegel, M.D.

as a means of quickly evaluating the radiologist work environment to determine what areas need improvement.

Created by then-masters of science candidate Hrönn Brynjarsdóttir and overseen by Alan Hedge, Ph.D., director of the Human Factors and Ergonomics Laboratory at Cornell, the checklist is divided into five sections:

- Display screens
- Input devices
- Workstation and workstation accessories
- Chair
- Ambient environment

Each section asks questions about the physical environment (such as desk height or room temperature) and the user (posture of the radiologist and how he/she uses the equipment). Users who complete the checklist are asked to refer to accompanying guidelines regarding what steps to take to address problems.

"Our premise is to control the things that we can, and controlling the design of the reading room is certainly something that falls into that category," Dr. Hedge said.

In more than a decade of researching ergonomics issues, Dr. Hedge has determined that as many as half of all radiologists will suffer from various musculoskeletal problems.

"Although it is now a given that radiologists are going to spend much of their time using computers, the reality is that hospital and facility folks somehow don't realize what the issues are," Dr. Hedge said. "There is a significant problem because time and again we have seen radiologists injured through poor design of their workstations."

Dr. Hedge cites financial concerns as a primary reason that ergonomic improvements are often sidetracked even though many upgrades are comparatively inexpensive.

"These improvements don't cost an arm and a leg," Dr. Hedge said. "Hospitals may spend millions on an MR imaging system, but completely renovating a reading room costs more like thousands, not millions, of dollars. It is hugely cost-effective to do this. Unfortunately it seldom happens." □

WEB EXTRAS

☑ To access the Cornell Digital Reading Room Ergonomics Checklist, go to ergo.human.cornell.edu/CDRREC.htm.

MINIMIZING DISTRACTIONS IMPROVES READING ROOM EXPERIENCE

Learning to manage distractions and interruptions in the reading room is another way radiologists can improve their day-to-day experience and minimize potential harm to patients and themselves, said Stephen D. Brown, M.D., chair of the RSNA Professionalism Committee.

But that is often easier said than done, said Dr. Brown, an assistant professor of radiology at Harvard Medical School and a radiologist at Children's Hospital Boston.

For example, a radiologist asked to monitor an MR imaging study for a sedated child must put aside a complex CT study on another child. That interruption could cause the radiolo-

gist to lose track of a subtle, or even not-so-subtle finding on the CT exam.

"It is a challenge not to be stressed by a disruption and it is a challenge to maintain the work flow," Dr. Brown said. "It is a challenge to get your concentration back once you've been distracted by one issue."

Ergonomics is closely linked to reading room interruptions and distractions that affect efficiency and productivity; overall health of the radiologist (stress); and patient care.

Distractions can come in the form of poor lighting, noise, an uncomfortable temperature and even technology. For example, radiologists who must keep their e-mail accounts

open while working clinically are often interrupted by incoming e-mails.

Education on actual management strategies is also essential, he said.

"When it comes to people, radiologists need to develop the art of being firm—of being diplomatic about saying, 'Can you please wait until I complete this task before I attend to your question?'" Dr. Brown said. "That means forming relationships with clinicians and others to allow you to say something thing like that comfortably. It takes time and a certain level of assertiveness."

3D and 4D Fetal Ultrasound Advances Spark Research, Create Challenges

While fetal sonograms were once used primarily to detect problems and measure growth, advances in 3D and 4D ultrasound technology now offer capabilities ranging from better visualization of congenital birth defects to dynamic, multiplanar views of the fetal heart.

ALONG with advances on the research front, the growing availability of 3D and 4D ultrasound technology has also increased public access to these ultrasound services—increasing the potential for safety risks to both mothers and their fetuses, expert say.

The mainstream press has been filled with reports of the latest trend for expectant parents—“ultrasound parties,” where a technologist performs ultrasound in the home and 3D and 4D images are immediately shared with friends and family in a celebratory environment. Party attendees view still 3D ultrasound images of the fetus and 4D ultrasound images that appear to show fetal movement in real time.

A host of new independent ultrasound services are helping parents turn what has traditionally been a private medical procedure into what one media outlet has dubbed “a new frontier in pregnancy oversharing.” Experts caution against using ultrasound for entertainment and stress that ultrasound should be performed on expectant mothers only when there is a clear diagnostic benefit.

“Patients, of course, love 3D pictures, but as radiologists we have to be careful that we’re not performing an ultrasound for the fun of it,” said Deborah Levine, M.D., co-chief of ultrasound and director of obstetric and gynecologic ultrasound in the Department of Radiology at Beth Israel Deaconess Medical Center in Boston. “Radiologists will perform a whole diagnostic study before ever providing that 3D picture for the patient.”

As for companies that provide these ultrasound services in parents’ homes, “I want to be clear that as radiologists we don’t condone them,” said Dr. Levine, also a professor of radiology at Harvard Medical School. “They’re strictly for entertainment and don’t serve a diagnostic purpose.”

Such ultrasound services pose a potential safety issue for patients, said Wesley Lee, M.D., co-director of the Texas Children’s Fetal Center at the Texas Pavilion for Women in Houston, who presented

ON THE COVER

Wesley Lee, M.D., performs an ultrasound on a patient at Texas Children’s Hospital.



Levine



Lee

“3D Imaging of the Fetus” at RSNA 2012. In general there is minimal risk with ultrasound if used appropriately, Dr. Lee said. “But if it is performed by a person not properly trained who is putting that transducer over the mother for hours and hours, then the question becomes whether it’s safe for the fetus,” added Dr. Lee, also a professor and section chief of women’s and fetal imaging in the Department of OBGYN at Baylor College of Medicine, Houston.

The American Institute of Ultrasound in Medicine (AIUM) states that using ultrasound to view, take a picture of, or find out the gender of a fetus without a medical indication runs contrary to good practice. AIUM offers resources on using ultrasound for entertainment purposes, including information sheets that ultrasound practices can print and distribute to patients. (See sidebar)

Clinical 3D-4D Ultrasound Have “Mix and Match” Potential

Developed more than 30 years ago, 3D ultrasound technology has been widely used in clinical practice in the last decade and continues to widen its reach as researchers explore innovative new applications.

“Patients, of course, love 3D pictures, but as radiologists we have to be careful that we’re not performing an ultrasound for the fun of it.”

Deborah Levine, M.D.

The technology provides physicians a “nice way to view surface characteristics of the fetus,” Dr. Levine said. “And there are certain anomalies that are easier to understand when you see them in 3D.” For example, 3D imaging can offer physicians a better view of birth defects such as a cleft lip and clubfoot, she said.

Dr. Levine also pointed out the illustrative benefits of 3D ultrasound for patients and physicians. “An ultrasound expert may understand an anomaly in 2D images, but frequently patients and the doctors counseling those patients have an easier time understanding a 3D image,” she said.

“Most of us are classically trained with 2D ultrasound and most of the diagnoses are pretty straightforward,” Dr. Lee said. “But sometimes you come out of an exam scratching your head without being entirely sure about a certain finding. Whether you are talking about 2D, 3D or 4D ultrasound, there are several different imaging modalities you can use depending on what kind of answers you are seeking.”

There are many different tools available in 3D ultrasound, such as the multiplanar display, where physicians are able to see, for example, orthogonal views of the fetal brain and its cavities, simultaneously, Dr. Lee said. “Navigating through these volumes with multiplanar views can be really helpful,” he added.

Surface rendering of 3D ultrasound images allows physicians to view the features of a baby’s face or hands or other surface details that allow them to search for genetic syndromes. Tools like maximum intensity projection let doctors better visualize fetal bony structures such as the skull or vertebra, while 3D inversion mode gives them the ability to examine fluid-filled structures, such as the fetal stomach or brain ventricles that ordinarily appear black in ultrasound. Thick slice scanning provides physicians a better look at fingers and toes, and anomalies like cleft palate.

When it comes to 4D ultrasound, spatial temporal image correlation (STIC) “is an innovative way to examine a moving heart, so that you can actually have dynamic multiplanar views of the heart,” Dr. Lee said. “And you can actually use all of these tools I’ve talked about to render the heart in 4D.”

All of these imaging tools, according to Dr. Lee, can be “mixed and matched. For example, in the case of an obstetric complication like vasa previa, doctors can use 3D ultrasound to obtain a rendered view that can be combined with, for example, color Doppler. “We can mix and match these modalities to see things in different ways that traditional ultrasound can’t show you,” Dr. Lee said.

3D Ultrasound Helps Assess Prenatal Nutritional Status

3D ultrasound also allows physicians to search quantitatively for information, which is driving Dr. Lee’s recent research on improving the precision of estimated fetal weight using fractional thigh volume measurements based on 3D scans.

Obstetricians have long relied on estimated weight to make decisions about the growth and health of a fetus. “Unfortunately, estimated birth weight doesn’t do a terrific job predicting postnatal nutritional status,” Dr. Lee said. Assessing the soft tissue of fetal limbs is a new method of assessing prenatal nutritional status, said Dr. Lee, who has spent several years studying the reliability of fractional fetal limb volume as assessed by 3D ultrasound.

In a prospective study published in the March 2013 issue of *Ultrasound in Obstetrics & Gynecology*, Dr. Lee and colleagues determined that the precision of a fetal weight estimation model using fractional limb volume (in this case the thigh), abdominal circumference and biparietal diameter was superior to that of the commonly used Hadlock method (based on biparietal diameter, abdominal circumference and femur length).

“We have to develop new ways and novel approaches for determining which babies are truly malnourished,” Dr. Lee said, “That’s why we are using fractional limb volume as part of the fetal weight estimation procedure to assess the fetus before delivery.” □



Image courtesy of Wesley Lee, M.D.



Image courtesy of Deborah Levine, M.D.

3D ultrasound technology continues to widen its reach as researchers explore innovative new applications. **Top:** A 3D ultrasound view of a 13-week-old fetus; **Bottom:** a 3D ultrasound view of a 31-week gestational fetus.

WEB EXTRAS

□ To access an abstract of the research, “Prospective Validation of Fetal Weight Estimation Using Fractional Limb Volume,” by Wesley Lee, M.D., and colleagues, go to onlinelibrary.wiley.com/doi/10.1002/uog.7327/abstract.

□ Access the American Institute of Ultrasound in Medicine (AIUM) information on using ultrasound for entertainment purposes at aium.org/patients/entertainment.aspx.

□ To view a video of 3D fetal ultrasound, go to rsna.org/NewsLandingPage.aspx.

Residents Gain Critical Experience Through Academic Research Program

While radiology residents with excellent academic track records throughout medical school are poised for success, many are missing one component that could prove critical to their professional advancement: a research background.

More than 20 years ago, realizing that residencies primarily focus on clinical training, a group of visionary radiologists set out to create an academic radiology research program offering residents exposure to research pivotal not only to their long-term careers but also in securing that first radiology position.

In 1990, the Introduction to Research program was established by RSNA, the Association of University Radiologists (AUR) and the American Roentgen Ray Society (ARRS). The program was renamed Introduction to Academic Research (ITAR) in 2008 to better reflect its content. Exposing second-year radiology residents to the wide world of teaching and research, ITAR is part of a comprehensive and ongoing effort to improve the quantity and quality of imaging research produced by radiologists.

"In the 1980s, very little research was being done and very few radiologists had National Institutes of Health (NIH) funding," said C. Douglas Maynard, M.D., 2000 RSNA president and a founder of the ITAR program along with Robert Stanley, M.D. and Bruce J. Hillman, M.D. "We knew we needed to do something to better prepare our physicians to do more research."

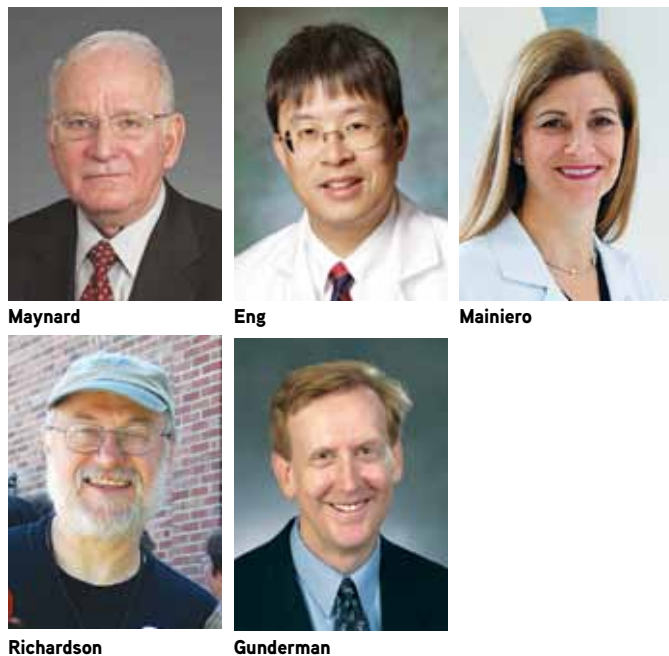
By reaching out to radiologists in training—before their career aspirations are finalized—ITAR provides a primer on academic radiology that isn't offered by residency programs.

"Residencies are primarily focused on clinical training; there is little exposure to academic research," said John Eng, M.D., an associate professor of radiology at The Johns Hopkins University in Baltimore, a former volunteer ITAR director and a seminar alumnus. "This program is a great way to give residents interested in an academic career more information so they can better make a career decision."

Program in Demand by Residents

Since 1990, approximately 1,760 residents from the U.S. and Canada have participated in ITAR, while others are waiting for their chance at an opening in the highly competitive program.

Held each year at the RSNA and ARRS annual meetings, ITAR includes 15 hours of presentations, small group discussions, a dinner reception and networking opportunities spanning four and a half days. ITAR is open to just 40 residents at each



Richardson

Gunderman

meeting, each of whom must be nominated by their department chair or residency director and then selected by RSNA and ARRS. To defray expenses, each resident's radiology department receives a \$1,000 stipend.

"Due to class size limitations, we have to turn away people every year," said Fiona Miller, director of RSNA's research department. "This type of programming is difficult to find—a comprehensive course that is experienced in the setting of a prestigious medical meetings. It's a big draw."

In addition to highlighting the various roles of academic radiologists, ITAR focuses on mentoring residents and providing them with skill sets they can use throughout their careers.

"I view our work as tending to the whole pipeline, from residents to junior faculty to RSNA Research & Education Foundation scholars."

Ruth C. Carlos, M.D.



Since 1990, approximately 1,760 residents from the U.S. and Canada have participated in RSNA's Introduction to Academic Research Program (ITAR), which exposes second-year radiology residents to the wide world of teaching and research. Above: ITAR participants collaborate with RSNA's Introduction to Research for International Young Academics (IRIYA) participants during a joint session in 2012.

"I view our work as tending to the whole pipeline, from residents to junior faculty to RSNA Research & Education (R&E) Foundation scholars," said Ruth C. Carlos, M.D., a professor of radiology at the University of Michigan, Ann Arbor, and an ITAR volunteer director. "That is how we will guarantee that radiologists will continue to conduct the molecular imaging, translational and outcomes research that will drive the field forward."

Medical school faculty members are equally enthusiastic about the program. "We love it," said Martha Mainiero, M.D., a professor of diagnostic imaging and residency program director at Brown University in Providence, R.I., and a past-president of the Association of Program Directors in Radiology (APDR). "I think the number one thing the seminar accomplishes is to get residents excited about research."

Exposing residents to the breadth of imaging research under way is one of the major objectives of ITAR, Dr. Carlos added.

"In practice, you know what you're getting into, but in academia, there's more latitude in shaping your career," Dr. Carlos said. "We cover all the opportunities from directing a residency program to bench research to translational research to conducting randomized controlled trials to bringing novel techniques to the bedside."

According to Dr. Mainiero and participating residents, ITAR provides a great overview of academic radiology. "When residents come back, they are always amazed," Dr. Mainiero said. "They say they never realized how much research was being conducted."

Seminar Topics are Useful, "Out of the Box"

ITAR speakers are all well-established in their fields and address highly useful topics such as designing and planning clinical research, preparing a manuscript and developing a successful mentoring relationship. The seminar also offers a handful of "outside of the box" presentations, such as those offered at RSNA 2012 by Michael L. Richardson, M.D., a professor of radiology at the University of Washington in Seattle, and Richard B. Gunderman, M.D., Ph.D., a professor and vice-chair of radiology at Indiana University (IU) in Indianapolis.

In his 45-minute lecture on public speaking, Dr. Richardson covered the evils of the bullet-pointed slide, managing stage fright and sure-fire ways to rivet your audience to your every word (hint, says Dr. Richardson: tell a story). Two of the many comments residents made about Dr. Richardson's talk in post-seminar evaluations: "I will never approach PowerPoint presentations the same way again" and "The lecture on how to make a better PowerPoint presentation was amazing and has universal applicability."

Dr. Gunderman, who also teaches philosophy and philanthropy at IU, encouraged residents to pay close attention to their natural curiosities and the work activities that make them feel most alive, and find ways to devote more time to those endeavors.

"Dr. Gunderman's talk reshaped the way that I approach and view my career," one resident commented about the presentation.

"Residents really get a lot out of the program and some write pages and pages of compliments on their evaluation forms," Dr. Eng said. "They appreciate the opportunity to be around other residents with similar career aspirations and to hear from established radiologists who have written their textbooks."

To help mentor residents, ITAR alumni are invited to return and participate in roundtable discussions, providing trainees with valuable feedback on life as junior faculty members. "When I went to school there were no role models for what I wanted to do," Dr. Richardson said. "This program is a great idea."

Program Accelerates Radiology Research

In addition to anecdotal data, there is ample evidence that the ITAR seminar—in concert with grant writing workshops, research scholarships and other RSNA programs—has helped radiology make significant strides in research.

In a 1998 study published in *Radiology*, Dr. Hillman and colleagues concluded that ITAR has encouraged the development of successful research careers and that seminar participants had higher levels of academic achievement earlier in their careers than residents who did not attend the program.

Over the last two decades, the amount of funding awarded to radiology departments from the National Institutes of Health (NIH) has significantly increased, from \$75 million in 1995 to approximately \$375 million in 2011, according to the 2012 Academy of Radiology Research Annual Report. As a percentage of the total NIH budget, imaging-related research has increased from 6.5 percent in 2001 to 12.2 percent in 2012, and is expected to continue to grow, according to the report.

"It's important to produce radiologists who conduct imaging research, especially clinician-radiologists who understand the problems of referring physicians," Dr. Carlos said. "Patient care takes a team and so does research." □

WEB EXTRAS

☑ To access the study, "The RSNA-AUR-ARRS Introduction to Research Program for 2nd Year Radiology Residents: Effect on Career Choice and Early Academic Performance," in *Radiology*, go to radiology.rsna.org/content/209/2/323.full.pdf+html?sid=864b8131-8825-4bfd-96ad-60cad220f567.

☑ The application deadline for the 2013 Introduction to Academic Radiology program is July 15. To access the nomination form, go to RSNA.org/Introduction_to_Academic_Radiology.aspx.

Quantitative Imaging Poised to Realize Full Potential in Cancer Research

An emerging discipline in radiology, quantitative imaging has enormous potential in oncology research as a means of predicting and measuring response to cancer therapy.

THROUGH its unique ability to extract defined information in vivo, quantitative imaging could facilitate adaptive therapy trial strategies allowing alternative treatment regimens when initial therapy response is ineffective. “Quantitative imaging can potentially help determine as early as possible if one or more drugs are working so that therapy can be modified,” said Laurence Clarke, Ph.D., branch chief of imaging technology development for the National Cancer Institute’s (NCI) Cancer Imaging Program. “The ability to predict and/or measure therapy response should provide a more robust means for both therapy dose management and correlation of imaging results with other laboratory biomarkers.”

But researchers excited by this potential are also frustrated by limitations in methods used to determine cancer treatment response, including reproducibility of measurements, incomplete data collection and poor radiologist-oncologist communication. To that end, NCI is conducting a number of initiatives within its Cancer Imaging Program designed to develop a broad consensus on quantitative imaging methods and to encourage the adoption of more standardized methods for quality assurance and quantitative imaging.

One such initiative—the Quantitative Imaging Network (QIN)—was designed to promote research and development of quantitative imaging methods for the prediction and/or measurement of tumor response to therapies in clinical trial settings, with the overall goal of facilitating the development of clinical decision support systems. QIN has made considerable headway since its founding in 2008.

“The QIN program was created to support multidisciplinary research teams to develop quantitative imaging methods to measure the response to therapy, using current commercial imaging platforms,” according to Dr. Clarke, QIN science officer. “The teams will then optimize the performance of their quantitative imaging tools with data collected from ongoing clinical therapy trials. A goal of QIN is to provide the image, metadata, clinical outcome data and measurement results as a public resource using The NCI Imaging Archive (TCIA).”

Putting Quantitative Data in the Hands of Radiologists

Currently QIN researchers are developing advanced methods for collecting and analyzing data across commercial platforms with the goal of creating software tools that are operator-independent, Dr. Clarke said.



Clarke



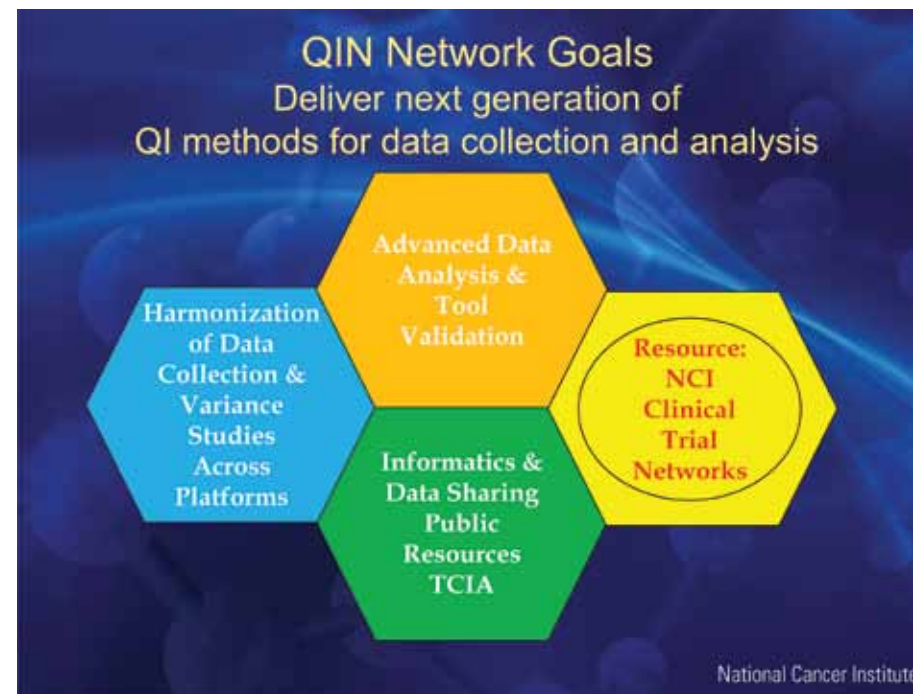
Sullivan

“Ideally, these tools wouldn’t require human intervention in terms of collecting or analyzing data,” Dr. Clarke said. “They would put the quantitative data in the hands of radiologists who could make decisions based on that information.”

That goal means interfacing with the makers of commercial imaging systems to develop the standards and tools acceptable for advancing industry-wide adoption, Dr. Clarke said. “We are encouraging industry participation in QIN in hopes that these large companies will take the tools developed by academic scientists, commercialize them and bring them to the clinical setting,” he said. “A large number of QIN teams are interfacing with several large and small imaging and software companies.”

“Quantitative imaging can potentially help determine as early as possible if one or more drugs are working so that therapy can be modified.”

Laurence Clarke, Ph.D.



Since its founding in 2008, the Quantitative Imaging Network (QIN) has made considerable headway in promoting research and development of quantitative imaging methods for the prediction and/or measurement of tumor response to therapies in clinical trial settings, with the overall goal of facilitating the development of clinical decision support systems.

Image courtesy of Laurence Clarke, Ph.D./National Cancer Institute

Although they are separate organizations, QIN works in tandem with RSNA’s Quantitative Imaging Biomarkers Alliance (QIBA) to interface with commercial vendors. Approximately 20-25 percent of QIN principal investigators are QIBA members.

While Dr. Clarke describes QIN as a “research engine” for quantitative imaging, QIBA brings all of the stakeholders to the table to work on a common goal: to industrialize and disseminate quantitative imaging and the use of mature imaging biomarkers in clinical trials and clinical practice by engaging researchers, health-care professional and industry.

QIBA comprises members from several academic medical centers, of the U.S. Food and Drug Administration (FDA), the National Institute of Standards and Technology (NIST), NCI, the American College of Radiology Imaging Network (ACRIN) and major imaging equipment manufacturers including GE, Phillips, Siemens and Toshiba, the Extended PhRMA Imaging Group and others. QIBA is supported by funding from the National Institute of Biomedical Imaging and Bioengineering (NIBIB).

RSNA’s overall goal in organizing QIBA five years ago was to improve the clinical value of routine quantitative imaging—an aspiration often complicated by limitations in the technology involved, said RSNA Science Advisor Daniel Sullivan, M.D., a professor in the Department of Radiology at Duke University and chair of the QIBA Steering Committee.

The problem, Dr. Sullivan pointed out, is that while clinical trials are needed to show the value of quantitative results, imaging equipment must be able to provide the needed accuracy and reproducibility of quantitative imaging data. “But in response to that request, manufacturers say that they need to know the clinical value of quantitative imaging,” said Dr. Sullivan. “It’s a question of which comes first—the chicken or the egg.”

Although QIBA is not an NCI initiative, the relationship between QIN and QIBA will ultimately facilitate NCI’s goal of promoting the role of molecular imaging in drug trials. One goal is the “qualification” of the proposed molecular imaging protocols that can be incorporated into current or future drug trials submitted to the FDA.

“FDA qualification of quantitative imaging biomarkers will be an important step toward the ultimate RSNA goal of widespread clinical use of quantitative imaging biomarkers,” Dr. Sullivan said.

Also critical to the process is the Cancer Steering Committee of the NIH Biomarker Consortium. Launched in 2006, the Biomarker Consortium was developed by the NIH and the Foundation of the NIH (FNIH) and is charged with coordinating public-private partnerships to advance the goal of standardizing and improving biomarkers. The Cancer Steering Committee focuses particularly on biomarkers, including imaging technologies, for use in development of new cancer therapies.

Quantitative Imaging Central to NCI goals

QIN, which continues to expand and currently comprises 16 technical teams and five working groups, held its annual meeting in March at the NIH Natcher Campus in Bethesda, Md., to update members on current issues and discuss future direction.

While he doesn’t expect a mature methodology to be finalized for another 5-7 years, Dr. Clarke stressed that quantitative imaging is central to realizing NCI’s goals. In fact, imaging is now poised to be one of the first biomarker methods that may be standardized within a reasonable time line, both nationally and, ideally, internationally.

“NCI is putting major resources into drug discovery and imaging plays a critical role in terms of prediction to drug response.” □

WEB EXTRAS

■ To view video interviews with Laurence Clarke, Ph.D., discussing quantitative imaging at RSNA 2012, go to rsna.org/NewsLandingPage.aspx.

■ For more information on the Quantitative Imaging Network (QIN), go to imaging.cancer.gov/programsandresources/specializedinitiatives/qin.

■ For more information on the Quantitative Imaging Biomarkers Alliance (QIBA), go to rsna.org/QIBA.aspx.

■ For more information on the Biomarkers Consortium, go to biomarkersconsortium.org.

Technical Challenges Hinder Use of Adrenal Vein Sampling

Despite its diagnostic accuracy, an interventional procedure that sheds light on a common adrenal gland disorder is underutilized—primarily due to challenges performing the procedure and interpreting results, according to recent research.

ADRENAL VEIN SAMPLING (AVS)—in which blood samples are taken from veins exiting the adrenal glands—is considered the gold standard for distinguishing aldosterone-producing adenomas from bilateral adrenal hyperplasia in patients with primary aldosteronism (PA). The distinction is crucial because aldosterone-producing adenomas are curable with unilateral adrenalectomy while bilateral hyperplasia is managed medically. However, AVS is technically challenging, experts say.

“The challenge is mainly due to the right adrenal vein,” said Scott O. Trerotola, M.D., the Stanley Baum Professor of Radiology and associate chair and chief of interventional radiology at the Hospital of the University of Pennsylvania, Philadelphia. “It is variable in appearance, it looks like nearby liver veins and it is very short and tough to get purchase in.”

Although the 2008 Endocrine Society Clinical Practice Guidelines recommend AVS for additional diagnostic information in PA patients, recent research suggests that physicians are not adhering to those guidelines. A study of 20 major referral centers published in the May 2012 issue of the *Journal of Clinical Endocrinology and Metabolism* found that almost one-third of eligible PA patients over a six-year period were not submitted for AVS despite the procedure’s very low complication rate of between 0.51 percent and 0.61 percent.

“AVS is not performed systematically because it is technically difficult to perform, not readily available at most centers and even more challenging to interpret,” said lead author Gian Paolo Rossi, M.D., chair of internal medicine at the University of Padua, Italy. “Doctors are convinced that it is dangerous, although our study demonstrated that it is not.”

Mayo Clinic Leads AVS Resurgence

AVS was first used in the 1960s but fell out of favor a decade later as physicians turned to abdominal CT to detect nodules on adrenal glands. Abdominal CT failed to live up to its initial promise, however, as many adrenal nodules were deemed either non-functioning or too small to be seen on CT.

“The accuracy of abdominal CT in correctly detecting aldosterone-producing adenomas was only 53 percent,” recalled William F. Young, M.D., chair of endocrinology at the Mayo Clinic in Rochester, Minn. “As a result, almost one-quarter of patients



Trerotola

Young

Rossi

sent to surgery based on the adrenal CT findings were not cured, while another quarter did not undergo surgery when it would have been curative.”

More centers returned to performing AVS as the inaccuracy of CT as a stand-alone approach became apparent. The Mayo Clinic resumed the procedure in 1990 after a 16-year hiatus. The clinic dedicates one radiologist to perform all AVS procedures, a strategy that helped make Mayo one of the leading centers in the country for PA patients.

“Half of the patients who come to us have experienced failed AVS at another facility,” Dr. Young said.

Also driving the resurgence of AVS is a growing awareness that PA is far more common than initially recognized.

In a large prospective study of patients referred to hypertension centers nationwide in Italy, 11.2 percent were found to have PA, according to research by Dr. Rossi and colleagues published in the November 2006 issue of the *Journal of the American College of Radiology*. Approximately 5 to 10 percent of people with high blood pressure have PA, according to Dr. Young.

“AVS is not performed systematically because it is technically difficult to perform, not readily available at most centers and even more challenging to interpret.”

Gian Paolo Rossi, M.D.

New Approaches Improve AVS Efficiency

The revived interest in AVS has challenged interventional radiologists to improve their proficiency.

Much of the current research in this area is focused on improving identification and sampling of the right adrenal vein, particularly for less experienced operators. Dr. Trerotola, who performs 40 to 50 AVS procedures a year with a more than 95 percent success rate, has suggested that the inferior accessory hepatic vein (IAHV) can be used as a guidepost to increase the success rate of the procedure.

“The inferior accessory hepatic vein is almost always within one centimeter of the adrenal vein,” he said. “I teach my fellows to look for an IAHV, which is easy to find. If there is one—as in about 60 percent of the population—we turn the catheter posteriorly and the adrenal vein is usually right there. Further, correctly identifying the IAHV helps avoid misinterpreting it as an adrenal vein.”

In a study published in the September 2011 issue of the *Journal of Vascular and Interventional Radiology*, Dr. Trerotola demonstrated that right AVS was successful in 95 percent of patients with a visible IAHV.

Dr. Trerotola’s study also demonstrated the benefits of using a renal double curve catheter to sample the right adrenal vein, successfully localizing the right adrenal vein in 61 of 73 patients (84 percent).

“Even very experienced interventionalists who have used the catheter say it is much better,” Dr. Trerotola said.

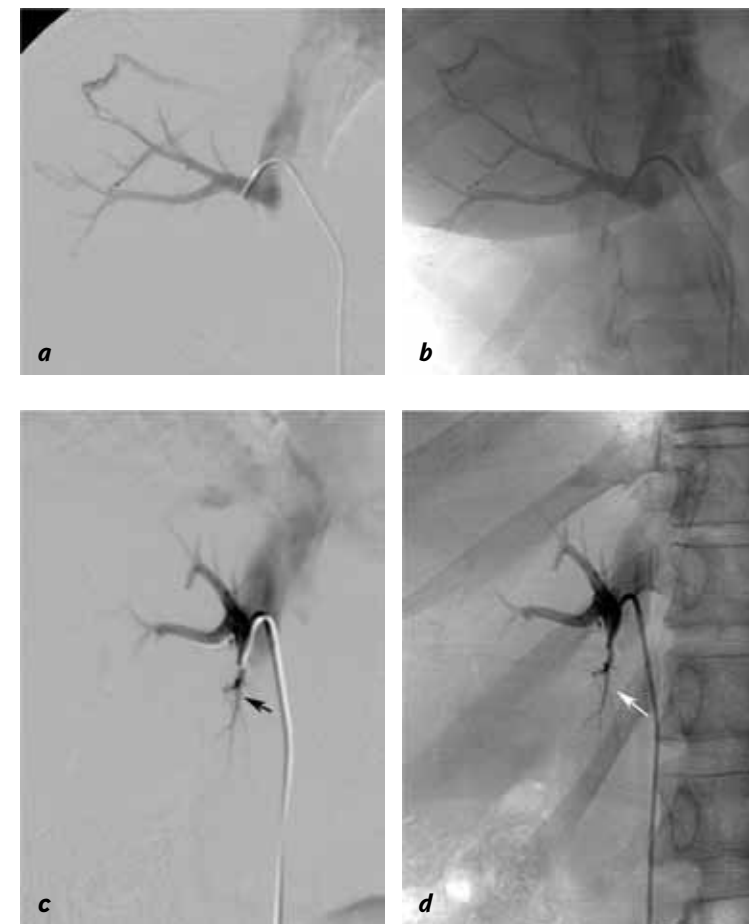
A rapid cortisol assay is another promising avenue toward improved AVS efficiency. Cortisol is a steroid hormone produced by the adrenal gland. “You need to get a cortisol level to prove you’re in the adrenal vein, but you have to send it out to a lab,” Dr. Trerotola said. “You can’t get it done in a point-of-care setting.”

A rapid cortisol assay would allow radiologists to confirm that they are in the adrenal vein during the procedure rather than having to wait for lab results. A study in the May 2011 issue of *European Journal of Endocrinology* from the University Hospital Innenstadt in Munich, demonstrated rapid cortisol assays improved the success rate of AVS from 55 to 85 percent, primarily due to improved targeting of the right adrenal vein, however turnaround time was still approximately one hour.

Researchers also have been exploring an image-based approach to AVS using C-arm CT, which is available in most modern angiography suites. By rotating the C-arm during an X-ray exposure, the equipment constructs a CT-type dataset for reviewing cross-sectional images.

Although Dr. Trerotola suggested that this approach might have a role for inexperienced clinicians, there are drawbacks.

“Personally I think the imaging approach is overkill and results in a lot of extra CT scans in this Image Wisely age,” Dr. Trerotola said, referring to the multi-society campaign to reduce and optimize radiation dose.



Scott O. Trerotola M.D., and colleagues demonstrated that right adrenal vein sampling (AVS) was successful in 95 percent of patients with a visible inferior accessory hepatic vein (IAHV). Above: Renal double curve (RDC) catheter selecting the right adrenal vein (RAV) immediately proximate to an IAHV. Subtracted (a) and unsubtracted (b) images from a right inferior accessory hepatic venogram in oblique projection. Subtracted (c) and unsubtracted (d) images from a right adrenal venogram in anteroposterior projection show filling of the hepatic vein and RAV (arrows). The selectivity index was 13.

J Vasc Interv Radiol 2011; 22:9:1306-1311

No matter the technical challenges, experts agree that AVS is an essential tool in speeding appropriate treatment to patients with PA.

“There’s been a big resurgence of interest in AVS and our goal is to teach people how to perform it better,” Dr. Trerotola said. “If we can show more than 90 percent accuracy, then the world will beat a path to our doorstep.” □

WEB EXTRAS

Access an abstract of the study, “The Adrenal Vein Sampling International Study (AVIS) for Identifying the Major Subtypes of Primary Aldosteronism” in the *Journal of Clinical Endocrinology and Metabolism* at www.jcem.endojournals.org/content/97/5/1606.abstract.

Access an abstract of the study, “Adrenal Vein Sampling Using Rapid Cortisol Assays in Primary Aldosteronism is Useful in Centers with Low Success Rates,” in the *European Journal of Endocrinology* at eje-online.org/content/165/2/301.abstract.

Access an abstract of the study, “The Inferior Accessory Hepatic Vein: An Anatomic Landmark in Adrenal Vein Sampling,” in the *Journal of Vascular and Interventional Radiology* at [www.jvir.org/article/s1051-0443\(11\)00444-1/abstract](http://www.jvir.org/article/s1051-0443(11)00444-1/abstract).

Access the Endocrine Society Clinical Guidelines at endo-society.org/guidelines/index.cfm.

Journal Highlights

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

Pericardial Disease: Value of CT and MR Imaging

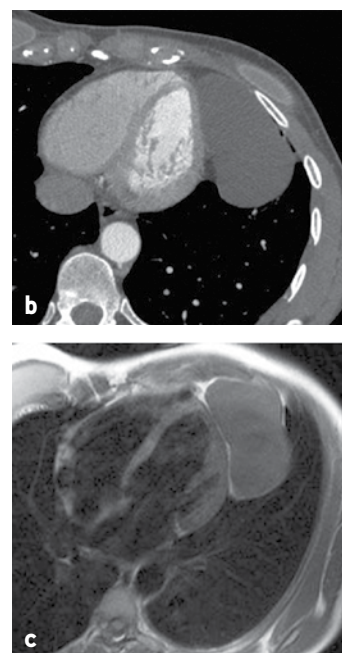
Transthoracic echocardiography, which combines structural and physiologic assessment, is the first-line technique for examination of patients suspected of having or known to have pericardial disease; however, cardiac CT and MR imaging are becoming increasingly popular for the study of this enigmatic part of the heart.

In a review in the May issue of *Radiology* (RSNA.org/Radiology), Jan Bogaert, M.D., Ph.D., of University Hospitals Leuven, Belgium, and colleagues describe how CT and MR imaging have dramatically shaped the current view on imaging of pericardial disease and how these techniques may contribute to the optimization of current patient care. The authors also discuss:

- Pericardial anatomy and physiology
- Imaging of normal pericardium
- Congenital and acquired pericardial disease

The authors focus on the rapidly evolving insights regarding pericardial disease provided by modern imaging modalities, not infrequently necessitating reconsideration of evidence that has thus far been taken for granted.

"Since pericardial diseases have substantial morbidity and mortality, both techniques (CT, MR imaging) have an increasingly important role in decision making, particularly in determination of the optimal treatment for patients with constrictive pericarditis," the authors write.



Typical appearance of a pericardial cyst. (b) Axial contrast-enhanced CT image shows presence of well-defined, oval-like, fluid-filled structure (attenuation: 3 HU) in broad contact with pericardium. (c) Cyst has low signal intensity on T1-weighted spin-echo MR image (one heartbeat/30, 90° flip angle, 1.4 × 2.0-mm in-plane resolution). No cystic wall is discernible on b-c. (*Radiology* 2013;267:2:340-356) ©RSNA, 2013. All rights reserved. Printed with permission.

Radiology

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

Imaging of Vascular Complications and Their Consequences Following Transplantation in the Abdomen

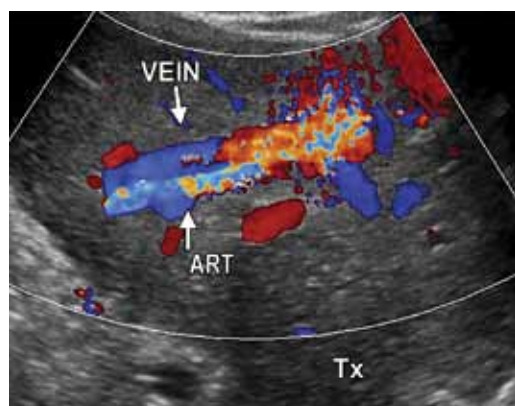
Transplantation in the abdomen is an established and effective treatment option in patients with end-stage organ failure. With the increase in organ transplantations being performed, especially living donor transplantations, radiologists have a critical role in posttransplantation patient care. Although graft rejection remains a histologic diagnosis, posttransplantation imaging appearances are reliable predictors of vascular complications and their consequences.

In an article in the May-June issue of *RadioGraphics* (RSNA.org/RadioGraphics), Gavin Low, M.B.Ch.B., of the University of Alberta Hospital, Canada, and colleagues offer a basic description of the standard surgical techniques performed in the abdomen and discuss the imaging appearances of vascular complications and their consequences after transplantation, including:

- Arterial thrombosis
- Arterial stenosis
- Venous thrombosis and stenosis
- Arteriovenous fistula formation
- Pseudoaneurysm formation

The relevant predisposing factors, clinical features, imaging appearances and potential treatment options for vascular complications of various types of transplantation are presented in a logical and integrated fashion.

"Transplantation in the abdomen is an established and effective treatment option in patients with end-stage organ failure," the authors write. "Radiologists have a critical role in graft monitoring and assessing complications."



Biopsy-induced AVF in a 6-year-old female recipient of a left-lateral-segment living-donor liver transplant. Axial color Doppler US image of the transplant (Tx) shows a large AVF with high-velocity aliasing involving its arterial inflow and venous outflow components (arrows). (*RadioGraphics* 2013;33:InPress) ©RSNA, 2013. All rights reserved. Printed with permission.

This article meets the criteria for **AMA PRA Category 1 Credit™**. SA-CME is available in print and online.

RadioGraphics' Call for Articles Celebrating RSNA's 100th Anniversary

As part of RSNA's 100th anniversary celebration at its 2014 and 2015 annual meetings, *RadioGraphics* is announcing a call for articles that address an important topic in the history of radiology.

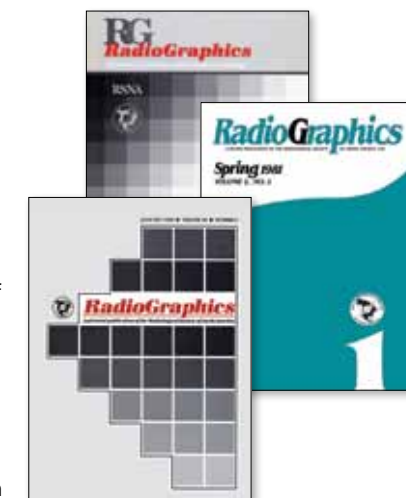
The ideal article will incorporate material that highlights the role that RSNA or *RadioGraphics* has played in improving the specialty, whether in the imaging of disease or through providing quality patient care. Preference will be given to reviews that highlight the history of a particular modality, the evolution in imaging of a particular body part or region, or the progress in evaluating specific disease processes.

Authors should contact Jeffrey S. Klein, M.D., *RadioGraphics* Editor, or William A. Murphy, Jr., M.D., *RadioGraphics* Editorial

Board Member, for historical papers, with a brief outline of their proposed material prior to submission.

All manuscripts intended for publication in 2014 must be submitted by September 3, 2013, with submissions for 2015 considered no later than September 2, 2014.

Guidelines detailing the length and format of these manuscripts can be found at RadioGraphics.rsna.org/site/pia/centralarticles.xhtml.



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RSNA 2012 Cases of the Day Now Online

A popular attraction at RSNA annual meetings, Cases of the Day from RSNA 2012 are now available online.

Cases of the Day—image-based case scenarios spanning 14 radiology subspecialties—are presented each day at the annual meeting. Participants review each case, submit a diagnosis and check the correct answer that is released the following morning. In the online format, participants who view the RSNA 2012 cases and submit diagnoses not only immediately see the correct answer but also receive instant feedback and can discuss the case with others.

Each Case of the Day is worth 1.00 *AMA PRA Category 1 Credit™*, which will be automatically transferred to the RSNA CME Credit Repository upon completion. Cases of the Day are free to RSNA members. Non-members may access online Cases of the Day for a fee of \$15 per case.

Browse the newest online Cases of the Day at RSNA.org/education/search/cod.



Radiology in Public Focus

Press releases were sent to the medical news media for the following articles appearing in recent issues of *Radiology*.

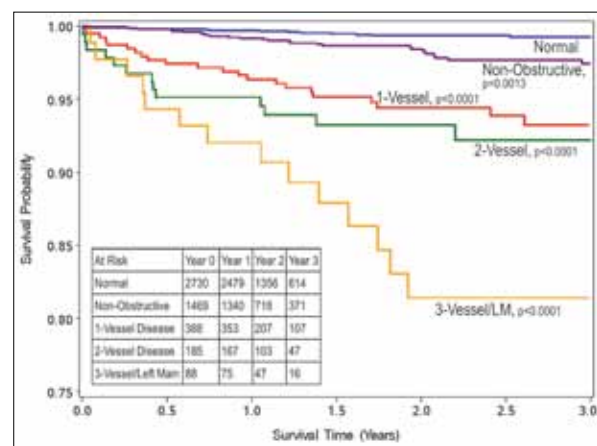
Cardiovascular Risk among Stable Individuals Suspected of Having Coronary Artery Disease with No Modifiable Risk Factors: Results from an International Multicenter Study of 5,262 Patients

AMONG individuals suspected of having coronary artery disease (CAD) without modifiable risk factors, CAD is common with significantly increased hazards for major adverse cardiovascular events (MACEs) and mortality, according to new research.

From an international multicenter cohort study of 27,125 subjects undergoing coronary CT angiography (CCTA) at 12 centers, Jonathon Leipsic, M.D., of St. Paul's Hospital, University of British Columbia, Vancouver, and colleagues identified 5,262 patients without known CAD and without modifiable risk factors.

In patients without medically modifiable risk factors, the presence of increasing burden of CAD was predictive of MACEs at the per-patient, per-vessel, and per-segment level across varying symptom and family history status. A relationship of increased CAD burden to all individual "hard" end-point components of MACE, including death, myocardial infarction and late target vessel revascularization is present.

"Coronary CT angiography allows for the identification of those at risk among patients without medically modifiable risk factors in a fashion not previously possible with traditional risk stratification tools alone," the authors write.



Unadjusted Kaplan-Meier curve for MACE-free survival on the basis of the presence of no, nonobstructive, and obstructive one-, two-, and three-vessel CAD for individuals without modifiable CAD risk factors (P values based on log-rank tests).

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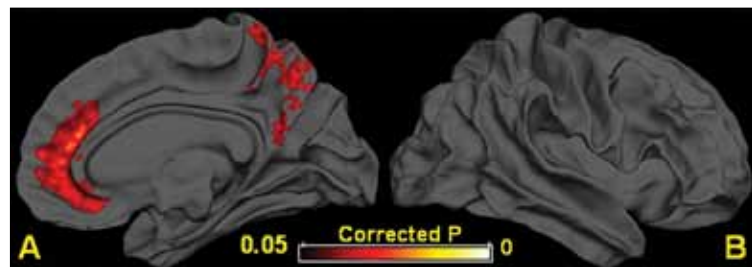
Mild Traumatic Brain Injury: Longitudinal Regional Brain Volume Changes

A SINGLE CONCUSSION may cause lasting structural damage to the brain one year after the injury, according to new research.

Yongxia Zhou, Ph.D., of New York University School of Medicine, and colleagues investigated changes in global and regional brain volume in patients one year after mild traumatic brain injury (MTBI). The study comprised 28 MTBI patients (19 followed at one year) with post-traumatic symptoms after injury and 22 matched controls (12 followed at one year). Researchers used 3D MR imaging to determine regional gray matter and white matter volumes and correlated these findings with other clinical and cognitive measurements.

One year after MTBI, global brain atrophy was measurably larger than that in control subjects. The anterior cingulate white matter bilaterally and the left cingulate gyrus isthmus white matter—as well as the right precuneal gray matter—showed significant decreases in regional volume in patients with MTBI over the first year after injury. These findings were confirmed by a cross-sectional comparison with data in control subjects.

"Regional brain atrophy is not exclusive to moderate and severe traumatic brain injury but may be seen after mild injury," the authors write. "In particular, the anterior part of the cingulum and the cingulate gyrus isthmus, as well as the precuneal gray matter, may be distinctively vulnerable one year after MTBI."



Coregistered data (from 28 patients with MTBI) projected onto right cerebral hemisphere template show areas of significant volume loss (Bonferroni-corrected $P < .05$) at one-year follow-up according to both the one-sample t test for within-group longitudinal comparison (patients at one-year follow-up compared with patients at initial visit) and the two-sample t test for across-group comparison (patients at one-year follow-up compared with control subjects) based on Freesurfer regional volumetry. A, and B, show medial and lateral views, respectively.

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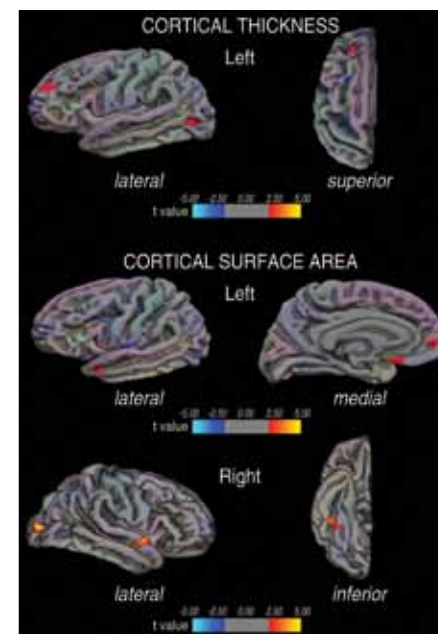
Cortical Abnormalities in Patients with Migraine: A Surface-based Analysis

CORTICAL ABNORMALITIES occur in patients with migraine and may represent the results of a balance between an intrinsic predisposition—as suggested by cortical surface area abnormalities—and disease-related processes, as indicated by cortical thickness abnormalities, according to new research.

Roberta Messina, M.D., of the Institute of Experimental Neurology, Vita-Salute San Raffaele University, Milan, Italy, and colleagues acquired T2-weighted and 3D T1-weighted MR images of the brain in 63 patients with migraine and 18 matched healthy control subjects. Using a general linear model approach, researchers conducted a vertex-by-vertex statistical analysis ($P, .01$) to assess between-group comparisons (migraine patients vs. control subjects), the aura effect, the effect of white matter hyperintensities and the correlations between cortical thickness and surface area measurements and patients' clinical and radiologic characteristics.

Compared with control subjects, patients with migraine showed reduced cortical thickness ($P, .01$) and cortical surface area ($P, .01$) in regions subserving pain processing; conversely, cortical thickness and cortical surface area were increased in patients with migraine in regions involved in executive functions and visual motion processing ($P, .01$), results showed.

"Accurate measurements of cortical gray matter abnormalities might be useful in better characterizing patients with migraine and in understanding the pathophysiologic processes underlying this condition," the authors write.



Vertex-by-vertex analysis shows regional differences in cortical thickness and cortical surface area in patients with migraine compared with healthy control subjects ($P < .01$) represented on an average brain map. Regions of increased cortical thickness or surface area are shown in red (color coded according to t value), and regions of decreased cortical thickness or surface area are shown in blue (color-coded according to t value). Only the most representative views are shown.

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Media Coverage of RSNA

In February, 1,629 RSNA-related news stories were tracked in the media. These stories reached an estimated 1.1 billion people.

Coverage included *Reader's Digest*, *Atlanta Journal-Constitution*, *Yahoo! News*, *The Huffington Post*, *TIME-Online*, *U.S. News & World Report-Online*, *Philly.com*, *Portland Press Herald*, *Palm Beach Post*, *Health & Medicine Week*, *Imaging Technology News*, *WYFX-TV* (Youngstown, Ohio), *KJTL-TV* (Wichita Falls, Texas), *KBTB-TV* (Beaumont, Texas), *Medical News Today*, *Auntminnie.com* and *Medscape.com*.



New on *RadiologyInfo.org*

Visit *RadiologyInfo.org*, RSNA and the American College of Radiology (ACR)'s jointly-sponsored public information website, to read the latest additions to the Diseases and Conditions section:

- Peripheral artery disease
- Stroke
- Renal failure
- Arthritis

MAY PUBLIC INFORMATION ACTIVITIES FOCUS ON STROKE

In recognition of American Stroke Month in May, RSNA is distributing public service announcements (PSAs) focusing on stroke imaging, interventional treatments for stroke and the importance of receiving stroke treatment quickly.

In addition to the PSAs, RSNA is also distributing the "60-Second Checkup" audio program to radio stations. This month, the program focuses on how brain angioplasty and stents have been found safe and effective for stroke patients.

Education and Funding Opportunities



2014 RSNA Clinical Trials Methodology Workshop

January 11-17, 2014
Scottsdale, Ariz.
Applications due
June 15

OVER THE COURSE of this 6½-day workshop, each trainee will be expected to develop a protocol for a clinical study, ready to include in an application for external funding. Participants will learn how to develop protocols for the clinical evaluation of imaging modalities. A dynamic and experienced faculty will cover topics including:

- Principles of clinical study design
- Statistical methods for imaging studies
- Design and conduct of multi-institutional studies
- Sponsorship and economics of imaging trials
- Regulatory processes

Applicants will undergo a competitive selection process for course entrance. Once admitted, trainees will participate in advance preparation, didactic sessions, one-on-one mentoring, small group discussions, self-study and individual protocol development. Familiarity with basic concepts and techniques of statistics and study design is required of all applicants.

More information and application/nomination forms for this program are available at RSNA.org/Research/educational_courses.cfm. Questions can be directed to Fiona Miller at 1-630-590-7741 or fmiller@rsna.org.

RSNA Derek Harwood-Nash International Fellowship

Applications due
July 1

THE DEREK HARWOOD-NASH FELLOWSHIP PROGRAM supports international scholars pursuing a career in academic radiology to study at North American institutions. Accepted participants will receive a stipend of up to \$10,000 from RSNA to be used toward travel, living expenses and educational materials for the 6- to 12-week fellowship period.

The application for this program is available at RSNA.org/Derek_Harwood-Nash_International_Fellowship.aspx. For more information e-mail CIRE@rsna.org.

Medical Meetings

May-June 2013

MAY 18-23

American Society of Neuroradiology (ASNR) 51st Annual Meeting and the Foundation of the ASNR Symposium 2013, San Diego Convention Center
• www.asnr.org/2013

MAY 19-22

Radiology Business Management Association (RBMA), 2013 Radiology Summit, The Broadmoor, Colorado Springs, Colo.
• www.rbma.org

MAY 28-30

The Russian National Congress of Radiologists, Radiology 2013, Crocus Expo International Exhibition Centre, Moscow
• www.radiology-congress.ru

MAY 29-JUNE 1

Interventional Oncology Sans Frontières (IOSF), Villa Erba International Exhibition and Congress Centre, Cernobbio, Italy
• www.iosfc2013.org

JUNE 3-7

European Society of Pediatric Radiology (ESPR), 50th Annual Meeting and 36th Postgraduate Course, Hotel Marriott Budapest, Hungary
• www.ESPR2013.org

JUNE 4-7

European Society of Gastrointestinal and Abdominal Radiology (ESGAR), 24th Annual Meeting, Palau de Congressos de Catalunya Conference Centre, Barcelona, Spain
• www.esgar.org

JUNE 4-8

Ultrasound meets Magnetic Resonance Congress and European Society of Magnetic Resonance in Neuropediatrics (ESMRN) Congress, Imperial Riding School Renaissance Vienna Hotel
• www.esmrnwien2013.org

JUNE 6-9

Society for Imaging Informatics in Medicine (SIIM), Annual Meeting, Gaylord Texan Resort and Convention Center, Grapevine-Dallas
• www.siim2013.org

JUNE 8-11

Society of Thoracic Radiology (STR), 3rd World Congress of Thoracic Imaging, COEX Convention and Exhibition Center, Seoul, Korea
• www.thoracicrad.org

JUNE 8-12

Society of Nuclear Medicine and Molecular Imaging (SNMMI), Annual Meeting, Vancouver, BC, Canada
• www.snmmi.org

FIND MORE EVENTS AT
RSNA.org/calendar.aspx

RSNA/AUR/ARRS Introduction to Academic Radiology Program

Applications due
July 15

SPONSORED BY RSNA, the American Roentgen Ray Society (ARRS) and Association of University Radiologists (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 Scientific Assembly in Chicago, December 1-6, 2013, or the ARRS Scientific Meeting in San Diego, May 4-9, 2014.

More information and application/nomination forms for this program are available at RSNA.org/Research/educational_courses.cfm. Questions can be directed to Fiona Miller at 1-630-590-7741 or fmiller@rsna.org.



Read more about the program in "Residents Gain Critical Experience Through Academic Research Program," on Page 9.

Quality Certificate Program

INTRODUCED IN 2011, the RSNA Quality Certificate Program is designed to recognize individuals who demonstrate knowledge in designated RSNA quality programs. Participants are recognized for their achievements and also gain knowledge in quality improvement, its significance to radiology and best-practice quality improvement techniques. More than 500 Quality Essentials Certificates have been awarded since the program started.

With the addition of two new courses that are part of the Quality Symposium at RSNA 2013, Quality Essential Certificates will be available in these categories:

- Quality Improvement in Your Practice
- Staff and Patient Safety
- Customer Satisfaction
- Radiologist Performance Improvement

A Quality Essentials Certificate is awarded to participants who earn 80 percent or higher on the related SAM test. Within six months of their first live offering at the RSNA annual meeting, the courses and tests are also available through RSNA's online education offerings.

New for 2013: Advanced Level Certificate

Beginning in 2013, candidates who meet the following criteria may earn an Advanced Level Quality Certificate:

1. Attain a Quality Essentials certificate in each of the four categories listed above.
2. Submit a Quality Storyboard that is accepted for display at an RSNA meeting or is deemed eligible for the Advanced Quality Certificate by the abstract reviewers.

For more information, go to RSNA.org/Quality_Improvement_Certificate_Program.aspx.



2013 CORE Workshop

Registration
Now Open

THE 2013 Creating and Optimizing the Research Enterprise (CORE) workshop will be held Friday and Saturday, Oct. 25 and 26, 2013, in Oak Brook, Ill. The workshop will focus on strategies for developing and/or expanding research programs in radiology, radiation oncology and nuclear medicine departments. The CORE Program features a combination of presentations, case studies and group discussions.

More information and registration is available at RSNA.org/Creating_and_Optimizing_the_Research_Enterprise_Workshop.aspx.

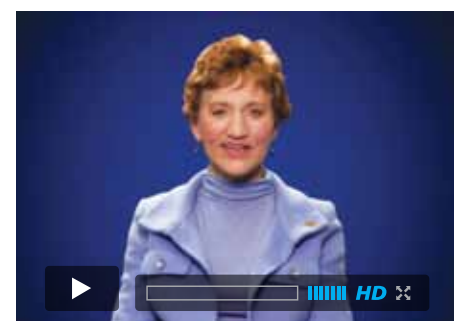
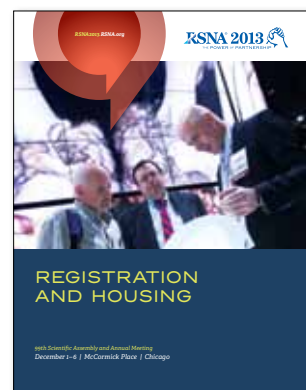


Annual Meeting Watch

News about RSNA 2013

Advance Registration and Housing Open May 8

RSNA 2013 advance registration and housing open May 8 for RSNA and AAPM members. General registration and housing open June 5. Advance Registration and Housing information is available at RSNA.org/Attendees.aspx.



GET ANNUAL MEETING UPDATES AT RSNA.ORG

Stay updated on the latest news of RSNA 2013 and view a video by 2013 RSNA President Sarah S. Donaldson, M.D., speaking on "The Power of Partnership," RSNA.org/Annual_Meeting.aspx.

International Visitors

International Letters Available—Act Now for Visa

Personalized letters of invitation to RSNA 2013 are available by request during online registration. In addition, the International Visitors section of RSNA.org/Attendees.aspx includes important information about the visa application process. Visa applicants are advised to apply as soon as they decide to travel to the U.S. and at least three to four months in advance of their travel date. International visitors are advised to begin the visa process now.

Hotel Deposits Required

A \$300 deposit is required to secure your hotel reservation. Reservations may be secured with a major credit card at the time of booking. **The credit card must be valid through December 2013 and will be charged by the hotel approximately two weeks before the annual meeting.** Registrants can also send a check, money order or wire transfer (payable to RSNA) for the hotel deposit. (Attendees are responsible for all wire transfer fees).

Course Enrollment Begins July 10

Course enrollment information will be mailed in late June to all members and 2013 meeting registrants and will also be available online at RSNA.org/Attendees.aspx. Those registering for RSNA 2013 prior to June 15 who want to view course enrollment information online only can "opt out" of receiving the copy by mail.

RSNA 2013 Registration

How to Register

There are four ways to register for RSNA 2013:

1 INTERNET (fastest way)
Go to RSNA.org/register

2 FAX (24 hours)
1-888-772-1888
1-301-694-5124

3 TELEPHONE
(Mon.-Fri. 8 a.m. – 5 p.m. CT)
1-800-650-7018
1-847-996-5876

4 MAIL
Experient/RSNA 2013
P.O. Box 4088
Frederick, MD 21705 USA

Registration Fees

	BY NOV. 8	AFTER NOV. 8	
	\$ 0	\$100	RSNA/AAPM Member
	0	0	RSNA/AAPM Member Presenter
	0	0	RSNA Member-in-Training, RSNA Student Member and Non-Member Student
	0	0	Non-Member Presenter
	180	280	Non-Member Resident/Trainee
	180	280	Radiology Support Personnel
	825	925	Non-Member Radiologist, Physicist or Physician
	825	925	Hospital or Facility Executive, Commercial Research and Development Personnel, Healthcare Consultant and Industry Personnel
	325	325	One-day registration to view only the Technical Exhibits

Important Dates for RSNA 2013

May 8	Member registration and housing opens
June 5	General registration and housing opens
July 10	Course enrollment opens
October 25	International deadline to have full conference badge mailed
November 8	Final housing and discounted registration deadline
November 27	Deadline to guarantee a seat for all ticketed courses
December 1-6	RSNA 99th Scientific Assembly & Annual Meeting

Register by November 8 to receive the discounted registration fee and full conference materials mailed to you in advance. International visitors must register by October 25 to receive these materials in advance. Registrations received after November 8 will be processed at the increased fee and conference materials must be obtained at the McCormick Place Convention Center.

For more information about registering for RSNA 2013, visit RSNA.org/Attendees.aspx, e-mail reginfo@rsna.org, or call 1-800-381-6660 x7862.

Residents & Fellows Corner

Retooled *RF Buzz* Sparks Conversation Among Trainees

Readers of RSNA's bimonthly e-newsletter designed exclusively for residents and fellows are now experiencing a whole new *RF Buzz*.

While still featuring important information about RSNA offerings, the retooled *RF Buzz* spotlights issues that engage trainees in deeper conversations on topics that matter most to them—now and as they enter practice.

The *RF Buzz* also features original articles with practical career advice from professionals in the specialty. The March edition featured "6 Moves Residents Should Make in Planning Their Future Career," based on an interview with Nazia Jafri, M.D., a breast

imaging fellow and recent residency graduate of the University of California, San Francisco, and a member of the *RSNA News* Editorial Board.

The colorful, image-rich format also offers more links to the RSNA resources that most interest trainees, including RSNA's radiology-specific job site, Career Connect, and select articles from *Radiology*, *RadioGraphics* and *RSNA News*.

Readers can access the most recent edition of *RF Buzz* at RSNA.org/Trainees.aspx, under Trainee Resources, Tools for Trainees.

RSNA.org

Stay Plugged Into Social Media on *RSNA.org*

Users logged onto *RSNA.org* to access the wide array of Society resources can also stay connected to RSNA's growing roster of social media links that keep you plugged into all things RSNA.

RSNA's Facebook Page connects users to interesting radiology-related articles and images along with program information, annual meeting updates, posts from fellow members and much more. Not a user? We invite you to join the more than 15,000 fans from across the globe who keep RSNA's Facebook Page buzzing.

Or click the RSNA Twitter icon to sample tweets from the more than 9,000 fans posting comments ranging from "RSNA 2012 Cases of the Day are available online" to "I just returned from RSNA so I have trucks of laundry!"—and everything in between.

Users can also access RSNA's LinkedIn page for professional networking, a photostream of RSNA images on flickr, a library of RSNA videos on Vimeo and RSNA video uploads on YouTube.



COMING NEXT MONTH

We report on recent *Radiology* studies offering the latest malpractice statistics, including the demographics of medical malpractice suits against radiologists and the causes of medical malpractice suits against radiologists in the U.S.

Make Technology Work for You



See how RSNA's free informatics tools and initiatives are designed to support the use of electronic health records and make your practice run smoothly.

Go to RSNA.org/Informatics

RSNA Informatics™