

RSNA® *News*



Treadmill Workstations Get Radiologists Moving

Also Inside:

- Filters Lower Radiation Dose in Adult, Pediatric CT
- Cardiac CT Studies Demonstrate Low Radiation Risk
- Photos Increase Radiologist-Patient Connection
- RadiologyInfo™ Uses Sound to Amplify Success

Abstract Deadline for RSNA 2009
April 15, 2009

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Virtual RSNA 2008 Available at *RSNA.org*

The virtual annual meeting at RSNA.org/virtual2008.cfm allows visitors to experience portions of RSNA 2008:

- More than 1,400 education exhibits and scientific posters in numerous subspecialties (access limited to RSNA 2008 attendees and RSNA members)
- Handouts for select RSNA 2008

refresher courses on such topics as MR and CT arthrography, pulmonary infections and using Adobe FLASH software.

- Award-winning education exhibits

A searchable meeting program is also available through the virtual meeting site, which will periodically be updated with new content.



New Web Site Kicks Off ABR 75th Anniversary

The American Board of Radiology (ABR) has launched its 75th anniversary celebration with an updated Web site at www.theabr.org. ABR unveiled the new site on Jan. 31, 75 years to the day after ABR was incorporated in Washington, D.C. ABR is now located in Tucson, Ariz.

ABR was the fifth national board to be formed as part of a movement to promote specialty standards in medicine. As the field of radiology has developed, various certificates have been added and deleted to accommodate new technologies and other developments. A member of the American Board of Medical Specialties, the ABR has issued more than 62,000 certificates since its inception in 1934.

ABR is also marking its 75th anniversary with the establishment of the ABR Foundation and the publication of a book on ABR history. The book, authored by Otha W. Linton, M.S.J., will be available starting in October.



Image Gently Campaign Offers Free Parent Education Materials

The Alliance for Radiation Safety in Pediatric Imaging, founder of the Image Gently campaign to lower pediatric radiation dose, has developed new materials to educate parents about medical imaging and to help them track their child's past imaging exams:

- **“My Child’s Medical Imaging Record”** allows parents to record where and when a study was performed, as well as the type of radiologic exam. Parents are encouraged to use this record as they do the widely utilized vaccination record and to encourage medical providers to make decisions regarding optimal timing of additional radiologic examinations with a better understanding of their child’s imaging history.
- **“What Parents Should Know About CT Scans for Children: Medical Radiation Safety”** and **“What Parents Should Know About Medical Radiation Safety”** are downloadable patient education brochures that provide lay definitions for various imaging exams utilizing radiation and discuss the benefits and potential risks associated with these studies.

The imaging record card and patient brochures are available at www.imagegently.org. Physicians are encouraged to download the materials and make them available in their waiting rooms and offices.



Ultrasound-guided Prostate Brachytherapy is Subject of AAPM Report

A new report issued by a special American Association of Physicists in Medicine (AAPM) task force addresses quality assurance requirements specific to transrectal ultrasound used for guidance of prostate brachytherapy.

Accurate imaging guidance and dosimetry calculation depend upon the quality and accuracy of the ultrasound image, necessitating a robust quality assurance program for the ultrasound system, according to the report. A brief review of prostate brachytherapy and ultrasound physics is provided along with recommendations for elements to be included in a comprehensive test phantom. The report is available online at www.aapm.org/pubs/reports/RPT_128.pdf.

MEDICAL IMAGING COMPANY NEWS

Medtronic to Acquire Ablation Frontiers

■ Medtronic, of Minneapolis, will acquire Ablation Frontiers, of Carlsbad, Calif., for an initial payment of \$225 million plus potential additional payments contingent upon achievement of clinical milestones. Medtronic manufactures a variety of products and therapies for diagnosis, prevention and monitoring of chronic conditions. Ablation Frontiers develops products designed to make ablation procedures safer and less time consuming.

NAS Report on Medical Isotopes Questioned

NUCLEAR MEDICINE society SNM has raised concerns about a National Academy of Sciences (NAS) report that calls the elimination of the highly enriched uranium (HEU) process—the primary source of medical isotopes in the U.S.—technically and economically feasible.

While SNM agrees with the long-term objective of eliminating HEU, it notes that the conversion to an alternative source will be years away, more costly than the report estimates and will

not alleviate the current ongoing shortages of medically necessary isotopes.

The majority of the U.S. supply of medical radioisotopes is produced using HEU targets at reactors in Canada and Europe. SNM notes that these foreign facilities have become increasingly unreliable due to unscheduled outages for age-related safety and maintenance issues.

While the NAS report focuses on potential security concerns related to isotope production using HEU, there

are significant regulatory, financial, environmental and patient issues linked with a conversion to low enriched uranium that must be taken into consideration before making any large-scale changes, according to SNM.

More information on the SNM position is available at interactive.snm.org. The NAS report, “Medical Isotope Production Without Highly Enriched Uranium,” can be purchased at www.nap.edu/catalog.php?record_id=12569.

PEOPLE IN THE NEWS

McClennan Receives SUR Medal

RSNA News editor **Bruce L. McClennan, M.D.**, has received the gold medal of the Society of Uroradiology (SUR). Dr. McClennan is a professor of diagnostic radiology at Yale University School of Medicine and an attending radiologist at Yale New Haven Hospital.

Also at the joint meeting of SUR and the Society of Gastrointestinal Radiologists (SGR) this month in Maui, Hawaii, **David S. Hartman, M.D.**, a professor of radiology at Penn State Milton S. Hershey Medical Center and College of Medicine, received the SUR Lifetime Achievement Award.

SGR awarded its Walter B. Cannon Medal to **Marc S. Levine, M.D.** Dr. Levine is chief of gastrointestinal radiology at the Hospital of the University of Pennsylvania and a professor of radiology and advisory dean in the University of Pennsylvania School of Medicine.



Bruce L. McClennan, M.D.



David S. Hartman, M.D.



Marc S. Levine, M.D.

Konski is Radiation Oncology Chair

Andre Konski, M.D., M.B.A., is the new chair of the Department of Radiation Oncology for the Wayne State University School of Medicine and service chief for radiation oncology at the Barbara Ann Karmanos Cancer Center, both in Detroit, Mich.

Dr. Konski previously served as chief medical officer for the Partners Program of the Fox Chase Cancer Center in Philadelphia.

CT

Tip of the Month

Noisy CT images can be made less noisy by reformatting with thicker slices, which may be especially helpful for large patients. The slice thickness required depends on the imaging task.

 American Association of Physicists in Medicine

SIR Announces Honors

The Society of Interventional Radiology (SIR) has bestowed its gold medal on **Andreas Adam, M.B.B.S., F.R.C.R., Vincent P. Chuang, M.D., and Thomas A. Sos, M.D.**

Dr. Adam, who received RSNA honorary membership in 2006, is a professor of interventional radiology at the University of London and honorary consultant radiologist at Guy’s and St. Thomas’ Hospital. Dr. Chuang is a vice-president at the Sun Yat-sen Cancer Center in Taipei, Taiwan, and head of the center’s angiography and interventional oncoradiology section. Dr. Sos is a professor and vice-chair of radiology at New York Hospital Cornell Medical Center and director of peripheral



Andreas Adam, M.B.B.S., F.R.C.R.



Vincent P. Chuang, M.D.



Thomas A. Sos, M.D.



Matthew A. Mauro, M.D.

arterial disease at Weill Cornell Vascular.

Matthew A. Mauro, M.D., Ernest H. Wood Distinguished Professor and chair of radiology at the University of North Carolina School of Medicine, presented the 2009 Charles T. Dotter Lecture at the SIR meeting this month in San Diego.

Kuhl Earns 2009 Japan Prize

The 2009 Japan Prize for technical integration of medical science and engineering has been awarded to **David E. Kuhl, M.D.**, a professor of radiology at the University of Michigan Medical School in Ann Arbor, Mich.

Dr. Kuhl, known as “the father of emission tomography,” was recognized by the Science and Technology Foundation of Japan for developing a novel method of tomographic imaging of the distribution of radioactive isotopes in the body. He is among 66 people in 13 countries around the world who have received the Japan Prize.



David E. Kuhl, M.D.



Correction:

A physician was misidentified in a photo accompanying the story on the RSNA International Visiting Professor trips to China (“Visiting Professors Find Modern Radiology Departments in China,” February 2009 *RSNA News*). Third from the left is Quanfei Meng, M.D., of Guangdong Provincial People’s Hospital in Guangzhou, China.

IN MEMORIAM

Gordon L. Brownell, Ph.D.

Gordon L. Brownell, Ph.D., regarded as a principal figure in the development of PET scanning, died Nov. 11 at the age of 86.

During his 58-year career, Dr. Brownell held joint appointments in radiology at Massachusetts General Hospital (MGH) and nuclear science and engineering at the Massachusetts Institute of Technology. He established and served as director of the MGH Physics Research Laboratory.

Dr. Brownell was known for working

with colleagues to develop a positron imaging machine in the early 1950s. Throughout the remainder of his career he worked on the technology as it developed into PET.

Among the many awards Dr. Brownell received were the SNM Loevinger–Berman Award for Excellence in Internal Dosimetry in 2006 and the Coolidge Award from the American Association of Physicists in Medicine 1987. He was elected to the Institute of Medicine in 2002.



Gordon L. Brownell, Ph.D.

Courtesy MIT Museum

IN MEMORIAM

Harry Z. Mellins, M.D.

Harry Z. Mellins, M.D., one of the founders of the Society of Uroradiology (SUR), died Jan. 22 at the age of 87.

Dr. Mellins was a professor of radiology and former residency program director in the Department of Radiology at Brigham and Women's Hospital in Boston. He delivered the Annual Oration in Diagnostic Radiology, "Cystic Dilatation of the Upper Urinary Tract: A Radiologist's Developmental Model," at RSNA 1983.

Revered as a radiology teacher and mentor, Dr. Mellins was known for his "definition of

a diagnostic radiologist," which read in part: "The radiologist perceived the shadow, sees a lesion and imagines the man. The bedside physician sees the man, perceives the signs and imagines the lesion. They practice from the outside in and we from the inside out."

Serving as SUR president in 1975, Dr. Mellins received the SUR gold medal in 2000 and the gold medals of the Association of University Radiologists in 1986 and American Roentgen Ray Society in 1989.



Harry Z. Mellins, M.D.

RSNA News Send news about yourself, a colleague or your department to rsnanews@rsna.org, 1-630-571-7837 fax, or *RSNA News*, 820 Jorie Blvd., Oak Brook, IL 60523. Please include your full name and telephone number. You may also include a non-returnable color photo, 3x5 or larger, or electronic photo in high-resolution (300 dpi or higher) TIFF or JPEG format (not embedded in a document). *RSNA News* maintains the right to accept information for print based on membership status, newsworthiness and available print space.

MY TURN

Serving Up Science with Cheese Sauce

HOW MANY parents have tried to coax their children into eating what's good for them by disguising it with something they think they will enjoy? Few kids like broccoli alone but all kids like cheese sauce—it's no secret that more kids will eat broccoli dressed with a cheddar ribbon.

Most practicing radiologists enjoy educational activities akin to that cheese sauce—that is, activities directly applicable to their jobs. They may know that radiology's future lies in the science of medical imaging and intervention—the broccoli—but few see direct benefits to their daily practice and therefore are less inclined to attend scientific sessions than educational activities.

As a result, RSNA has sought ways to mix education with science

and stimulate interest in new scientific developments for our specialty. A few years ago, the RSNA Refresher Course and Scientific Program committees developed new hybrid courses—series courses—that blend classic scientific sessions and refresher courses focused on similar topics.

Results of the first series courses suggested a few important lessons. Topics best suited for blending science with education are of high interest and applicable to common clinical problems in radiology as well as being fairly homogeneous and well-focused.

Series courses have increased in popularity since their inception. The



James A. Brink, M.D.

greatest success has been in pediatric radiology, where subspecialists have eagerly embraced the blending of science and education. This enthusiasm has spread to other disciplines, where attendance has been strong and feedback generally positive.

This enthusiasm bodes well for radiology's future. Only by embracing science may we hope to translate new developments into clinical practice.

Put another way: We all know broccoli is good for us, but a little cheese sauce never hurts.

James A. Brink, M.D., is a professor and chair of the Department of Diagnostic Radiology at Yale University School of Medicine. Dr. Brink chairs the RSNA Refresher Course Committee.

My Turn
ONE RADIOLOGIST'S VIEW

CALL FOR ABSTRACTS



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RSNA 2009
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Radiological Society of North America

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McCormick Place, Chicago

*Includes sessions in
joint sponsorship with the
American Association of
Physicists in Medicine*

Treadmill Workstations Get Radiologists Moving

RADIOLOGISTS can add simultaneous physical exercise on a treadmill to their daily image reading routines without compromising diagnostic accuracy, according to an exhibit presented at RSNA 2008.

“Radiologists have a relatively sedentary workday in comparison to other healthcare workers and especially in comparison to other workers in general,” said Ameer Patel, M.D., a resident at the University of Maryland Hospital and Baltimore VA Medical Center, who presented “Walking While Working: A Demonstration of a Treadmill-based Radiologist Workstation.”

“Radiologists can increase their energy expenditure by a factor of more than 2.5 by walking on a treadmill for a portion of their day, even at only 1 mile per hour,” said Dr. Patel.

Dr. Patel and colleagues tested a combined treadmill and workstation, called a walkstation, in a pilot involving detection of lung nodules on conventional chest radiographs. Performance was measured with radiologists sitting, standing and walking.

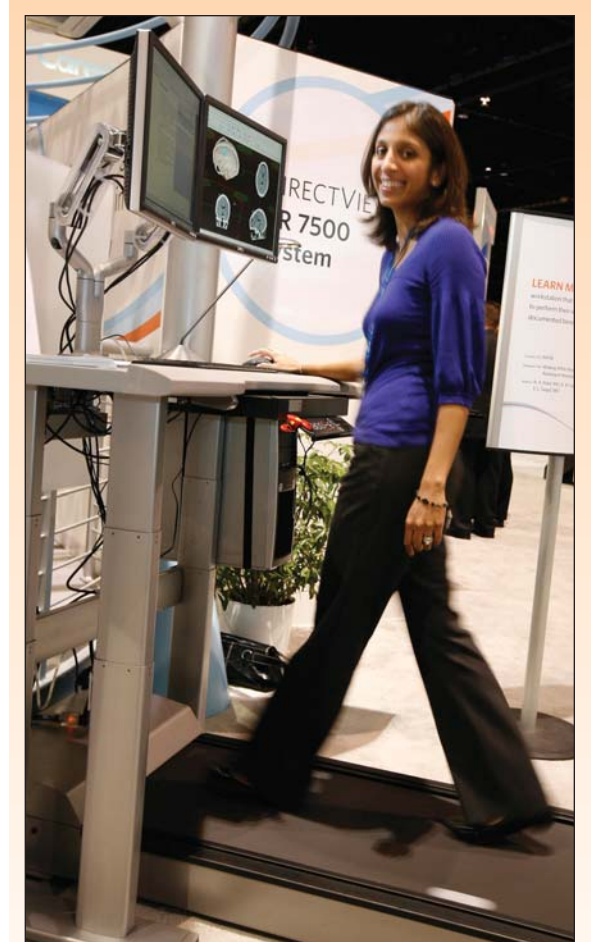
The concept of adding physical activity to sedentary work is not new—combined work/exercise equipment is gaining popularity in healthcare and other professions with offerings from a number of manufacturers.

Dr. Patel said her study addresses concerns about distraction and loss of accuracy for radiologists. “I think these are valid concerns,” she said. “That is the precise reason studies should be done to provide scientific data showing how performance while on the walkstation varies from the traditional reading room where the radiologist sits in front of a workstation. This was our goal when we conducted our pilot earlier this year.”

No Significant Difference in Accuracy Seen

Results showed sensitivity and specificity, respectively, of 71 percent and 77 percent for sitting, 76 percent and 69 percent for standing, and 80 percent and 56 percent for walking. “Our study showed no significant change in the accuracy in the detection of lung nodules on chest radiographs among three image interpretation modes,” Dr. Patel said, noting that there was also no evidence of memory effect. “Not only have we found that radiologists can use a walkstation while interpreting diagnostic imaging studies, but we were unable to find any decrease in diagnostic accuracy,” she said.

Regarding the increase in sensitivity—but decrease in specificity—from sitting to walking, Eliot L. Siegel, M.D., offered a theory. “A very well-known radiologist, the late Dr. Ben Felson, wrote in his famous ‘red book’ about a ‘cowboys and Indians’ phenomenon, in which the Indians were able to see better because, in fact, their heads were bobbing up and down, either on the run or on a horse,” said Dr. Siegel, a professor of diagnostic radiology and nuclear medicine at the University of Maryland Medical Center and a member of the RSNA Radiology Informatics Committee. “Perhaps the same factors are at play



Ameer Patel, M.D., and colleagues tested a combined treadmill and workstation, called a walkstation, in a pilot involving detection of lung nodules on conventional chest radiographs. Performance was measured with radiologists sitting, standing and walking.

with the walkstation. I haven't even talked to Ameer about this yet, but I'd love to do a phantom study with different objects of different sizes and test the effects of movement on visualization.”

Responses to the walkstation have been varied, said Dr. Patel. “Some people liked the prospect of increasing activity levels while doing their work because they were naturally active individuals,” she said. “Others found the apparatus distracting and preferred to sit

down during read-outs.” She suggested a stationary bicycle might be more readily accepted by those radiologists.

The walkstation is configured with three monitors and its treadmill can be set at speeds from 0.3 to 2.0 miles per hour. “The treadmill is specially designed to be quiet in order to minimize distraction from noise and the potential negative impact on speech recognition,” said Dr. Patel.

To implement systems like the walkstation into daily practice, Dr. Patel recommends that radiologists give

Radiologists can increase their energy expenditure by a factor of more than 2.5 by walking on a treadmill for a portion of their day.

Amee Patel, M.D.

themselves time to acclimate to the system before attempting to regularly read studies while on the treadmill. “Most people who have tried the apparatus agreed that it takes time to adjust to the concept of moving while reading studies,” she said.

“Also, it is important that radiologists maintain good ergonomics with regard to their height in comparison to the monitor—they should be looking straight at or down by no more than 10 percent at the monitor, should be approximately 22 to 25 inches from the monitor and should have a comfortable angle to hold the mouse or track ball,” Dr. Patel continued.

Monitors should be mounted in such a way as to minimize vibration, she added. □

Safety Just as Important as Ergonomics

ALSO PRESENTED at RSNA 2008 was a study showing the effectiveness of modular, lead-lined shielding in reducing staff exposure to radiation.

Radiation exposure to staff at Hillman Cancer Center in Pittsburgh dropped by 15 percent in unrestricted areas when modular, lead-lined uptake shields were used, according to lead author Francis Talbot, M.B.A., C.N.M.T., an account executive with IBA Molecular in Dulles, Va.

Originally designed in 2002 to accommodate 20 scans per week, the cancer center was handling scans for 17 patients a day by 2007. The dramatic increase in scanning volume in the facility’s PET/CT department has also increased the radiation dose in restricted and unrestricted areas of the facility, according to Talbot, former director of clinical PET/CT operations at the University of Pittsburgh Medical Center (UPMC).

To offset the impact of radiation exposure, staff at Hillman installed two modular, lead-lined shielding enclosures in the uptake room where two PET/CT patients are treated at the same time. Patients rest for an hour in that room to allow uptake after being injected with 18-FDG, Talbot said.

Talbot said the modular shielding, which resembles an office cubicle, is also equipped with a lead ceiling to protect staff on the floor above the room. The shields were custom-made for Hillman by Milwaukee-based Vulcan Global Manufacturing Solutions based on a UPMC design.

Talbot and colleagues added the dosimetry reports for all technologists assigned to the PET/CT scanner for a six-month period prior to the equipment’s installation and divided that sum by the number of patients scanned during that time period to determine the radiation dose contribution per patient before shielding. Researchers followed the same process in computing data for the six-month period after installation.

Results showed that before the lead shields were added to the uptake room, radiation exposure to a technologist was 2.66 milliRoentgen (mR) per patient. After the modular shields were added, exposure dropped to 2.23 mR per patient, for a decrease of 15 percent.

Although the shields were installed primarily as a means of reducing radiation exposure to the floor above, Talbot says it also lowered exposure to the technologists performing the studies.



Francis Talbot, M.B.A., C.N.M.T.
University of Pittsburgh Medical Center

Learn More

Abstracts for studies presented at RSNA 2008 are available online.

- “Walking While Working: A Demonstration of a Treadmill-based Radiologist Workstation”
RSNA2008.RSNA.org/event_display.cfm?em_id=6011404
- “The Effect of Modular Lead Shields on Occupational Radiation Exposure in a Busy Clinical PET/CT Department”
RSNA2008.RSNA.org/event_display.cfm?em_id=6005373

■ Note: These articles were adapted from stories that appeared in the RSNA 2008 *Daily Bulletin*. Daily newspapers from the annual meeting are available online at RSNA.org/bulletin.

**Daily
Bulletin**

Filters Lower Radiation Dose in Adult, Pediatric CT

TECHNOLOGY continues to help reconcile radiology's dual needs for image quality and low CT radiation dose, according to new research from Massachusetts General Hospital (MGH) in Boston.

One study presented at RSNA 2008 showed that radiation dose can be reduced by as much as 75 percent in adults who require a chest CT with the use of 2D non-linear adaptive filters (2D-NLAF) that effectively decrease image noise in low-dose CT scans without compromising image quality. A second study presented at RSNA 2008 showed a reduction of 25 to 30 percent in radiation dose for pediatric chest and abdominal CT scans with the use of those filters. Both studies were conducted between April 2007 and April 2008.

"2D-NLAF post-processing of low radiation dose CT images increases the diagnostic acceptability of low-dose images without compromising the diagnostic information," said lead author of both studies, Sarabjeet Singh, M.B.B.S., M.M.S.T., a cardiac imaging research fellow at MGH.

Radiologists Asked How Low They Can Go

Such research not only reinforces continued efforts by radiologists to lower radiation dose but also helps steer new technology from the research lab to the exam room, experts said. With continued media scrutiny and a rapidly climbing number of CT scans each year, the pressure remains on radiologists to show how low they can go in terms of dosage—especially in children, experts said.

"Studies like these show that the radiology community is stepping up to

the challenge and continuing to lower the dosage," said Cynthia H. McCollough, Ph.D., director of the CT Clinical Innovation Center and a professor of radiological physics at the Mayo Clinic in Rochester, Minn. Dr. McCollough presented a refresher course on radiation dose for CT angiography at RSNA 2008. "We're doing a lot of CTs but the dosage from each exam gets lower and lower," she said. "Images now are being done at about half the dose used in the 80s."

Algorithms Resemble Human Vision System

Adaptive filtering has proven to reduce noise and enhance CT images without losing edge, boundary or feature details. The 2D-NLAF software used by Dr. Singh and colleagues is based on algorithms that resemble the human vision system. The software analyzes each part of the picture, removing random noise without affecting image

2D filters can help reduce CT radiation dose for chest examinations by as much as 75 percent without compromising diagnostic acceptability or lesion detection.

Sarabjeet Singh, M.B.B.S., M.M.S.T.

quality, lesion detection, conspicuity or reader confidence, said Dr. Singh.

"Our studies point out some important features of the algorithm, like preserved Hounsfield Units (HU) and sharpness of small structures without creation of artifacts," he said.

In the first half of a two-part study, Dr. Singh and colleagues took 35 limited chest multidetector CT scans at both standard (144-224 mAs) and

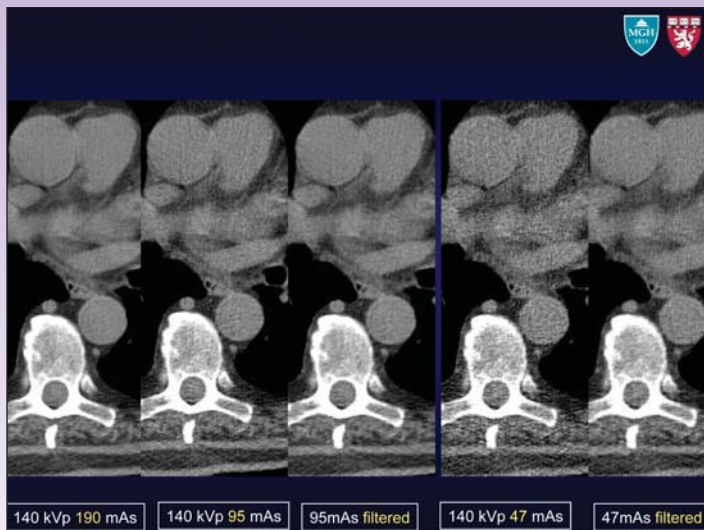


Sarabjeet Singh, M.B.B.S., M.M.S.T.
Massachusetts General Hospital

one-half (72-112 mAs) radiation doses. Low-dose images were processed through 2D-NLAF filters at two settings to reduce noise and increase sharpness. Standard and original and filtered one-half dose images were randomized and reviewed by two radiologists for image noise, contrast, visibility of small structures and presence of artifacts.

In the study's second part, 18 standard dose (150-190 mAs) chest multidetector CT scans with subtle lesions were post-processed using noise projection software to obtain 50 percent (70-95 mAs) and 75 percent (40-50 mAs) simulated low-dose images, which were then processed using the same filters. In addition to the image criteria, images were reviewed for lesion size, number, conspicuity, likely diagnoses and diagnostic acceptability.

In both study parts, all low-dose scans showed significant improvement in subjective and quantitative image noise with 2D-NLAF filters, without



Radiation dose can be reduced by as much as 75 percent in adults requiring a chest CT with the use of 2D non-linear adaptive filters (2D-NLAF), according to a study presented at RSNA 2008. These low-dose, filtered adult chest CT images show lower image noise for both 50 and 75 percent levels.

showing any loss of contrast or visibility of small structures, Dr. Singh said. All 26 lesions were seen on standard- and low-dose original and filtered images, and there was no significant difference in CT number, lesion conspicuity, characterization and reader confidence between filtered 75 percent low-dose and standard-dose images.

“Results show that 2D filters can help reduce CT radiation dose for chest examinations by as much as 75 percent without compromising diagnostic acceptability or lesion detection,” Dr. Singh said.

Filters Lower Dose in Pediatric Follow-up Imaging

A second study showed that 2D-NLAF can help reduce radiation dose for pediatric chest and abdominal CT by improving low-dose follow-up CT imaging.

Dr. Singh and colleagues examined 26 children who underwent follow-up chest and abdominal CT after initial exams. Follow-up CT exams were performed at 25 to 30 percent lower dose compared to the initial CT study with use of automatic exposure control and

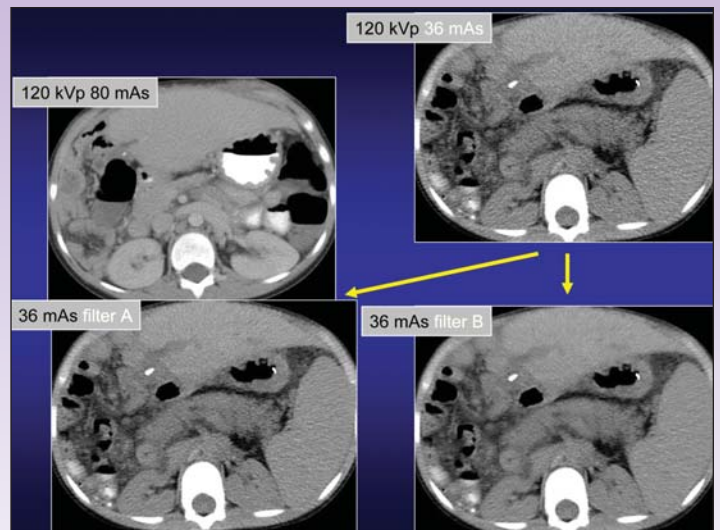
post-processed with 2D-NLAF. Results showed significant improvement in qualitative and objective noise after 2D-NLAF when compared to unfiltered low dose images, but no difference in HU value, visibility of small structures, lesion conspicuity and diagnostic confidence.

“Using 2D-NLAF can help reduce radiation dose for pediatric chest and abdominal CT by increasing the acceptability of low-dose, follow-up CT imaging,” said Dr. Singh.

Larger Study Under Way

Further research into noise reduction tools like 2D-NLAF filters will move the technology closer to broad-scale implementation, said Dr. Singh, who is conducting a larger study. “We are acquiring low radiation dose CT images in 400 patients and will have more data after processing these cases with 2D filters,” he said.

Ultimately, the goal is to get the most information from a CT scan using the least radiation, said Dr. McCollough. “It’s like squeezing water from a sponge,” she said. □



2D non-linear adaptive filters (2D-NLAF) can help reduce radiation dose for pediatric chest and abdominal CT by improving low-dose follow-up CT imaging, according to a study presented at RSNA 2008. Here, low-dose post-processed images of a 7-year-old male with history of liver transplant indicate lower noise.

Images courtesy of Sarabjeet Singh, M.B.B.S., M.M.S.T.

Learn More

Abstracts for studies presented at RSNA 2008 are available online.

- “Two-dimensional Image Filters for Reducing Radiation Dose for Multidetector Chest CT: A Double Blinded Study” RSNA2008.RSNA.org/event_display.cfm?em_id=6012724
- “Can Adaptive Filters Help Reduce Radiation Dose for Follow-up Chest and Abdominal CT in Children?” RSNA2008.RSNA.org/event_display.cfm?em_id=6016172

Other radiation dose-related presentations at RSNA 2008 included topics such as cumulative radiation exposure and cancer risk estimates in emergency department patients undergoing multiple CT scans, justification for using CT enterography in younger patients and the availability, awareness and use of dose reduction technologies among radiologists. See the abstracts for these presentations and others by going to RSNA2008.RSNA.org, clicking Meeting Program in the lefthand sidebar and searching using the keywords “radiation dose.”



RSNA2008
Personal Learning in the
Global Community

Cardiac CT Studies Demonstrate Low Radiation Risk

NEW STUDIES presented at RSNA 2008 challenge reports of high radiation risk from cardiac CT and offer ways to even further reduce the risk.

U. Joseph Schoepf, M.D., a professor of radiology and medicine at the Medical University of South Carolina in Charleston, took aim at studies published in 2007 in *The New England Journal of Medicine* and *The Journal of the American Medical Association* on lifetime cancer risks from radiation received during computed tomography coronary angiography (CTCA).

There is nothing wrong with the conduct and findings of the *NEJM* and *JAMA* studies using the Biological Effect of Ionizing Radiation (BEIR) VII Phase 2, said Dr. Schoepf. “However, for these studies there wasn’t a single, actual patient scan performed,” he said. “The results were extrapolated from the atom bomb radiation survivors to radiation received at CTCA, which is not necessarily a valid approach, considering the differences of these radiation sources,” he said.

Working with Walter Huda, Ph.D., Dr. Schoepf studied 104 patients undergoing 64-slice CTCA.

Researchers found a 0.12 percent lifetime risk for developing cancer from radiation received during the scan—dramatically lower than the one in 114 risk reported by the press from the journal articles. “Our assessment is more reflective of the real world,” said Dr. Schoepf.

The highest radiation dose risk was found to be in the breast and lungs. “This is a very theoretical risk,” said



U. Joseph Schoepf, M.D.
Medical University of South Carolina

Dr. Schoepf. “However, CT can diagnose life-threatening conditions in a non-invasive way. There is a much greater real risk of dying from complications during invasive work-up or if cardiac conditions go undiagnosed if a patient refuses a CT scan for fear of radiation.”

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U. Joseph Schoepf, M.D.

dose varies significantly between study sites and CT systems. Authors of the *JAMA* article call for improved education of physicians, noting that radiation exposure could be reduced substantially with uniform application of dose reduc-



Sebastian Leschka, M.D.
University Hospital Zurich, Switzerland

tion techniques that are currently used only infrequently.

The *JAMA* article is important because it provides for the first time a global and objective benchmark of radiation exposure associated with cardiac CT, said Dr. Schoepf.

“This article tells the story of learning and learning curves in the adaptation of new technology,” he said. “We see that it takes time for novel developments to penetrate clinical practice, but also that we can be optimistic about their eventual implementation.”

Effects of Dose Reduction on Image Quality Examined

Another study presented at RSNA 2008 investigated the effect of low kilovoltage dual-source CTCA on qualitative and quantitative image quality parameters and the radiation dose.

“CTCA represents a rapidly evolving imaging modality for the assessment of coronary artery morphology

Pulmonary Embolism a Focus of Chest Series Presentations

OTHER STUDIES presented at RSNA 2008 explored the use of CT venography (CTV) and CT pulmonary angiography (CTPA) in cases of suspected pulmonary embolism (PE).

CTV should not be routinely performed in patients receiving CTPA for suspected PE, unless there are associated risk factors for PE or deep vein thrombosis (DVT), said Dameon Duncan, M.D., M.B.A., who presented his study during the chest series course.

Dr. Duncan and colleagues performed a retrospective analysis of combined CTV and CTPA (CTVPA) reports between May 2003 and June 2006 at Long Island Jewish Medical Center in New Hyde Park, N.Y. The study focused on 1,315 patients undergoing diagnostic CTVPA, dividing patients into groups according to combinations of PE and DVT findings. Data was then analyzed to further categorize patients by reported risk factors for DVT.

Results showed that 51.9 percent of all patients had risk factors for DVT, while 48.1 percent did not. Of the 638 patients with risk factors for DVT, 13.6 percent had DVT and 86.4 percent did not; 2.1 percent of all patients



Dameon Duncan, M.D., M.B.A.
Long Island Jewish Medical Center



Michael Lu, M.D.
University of California, San Francisco

did not have risk factors and were positive for both PE and DVT; and 0.8 percent of all diagnostic CTVPAs did not have risk factors, were negative for PE and positive for DVT.

Another study looked at whether the interval increase in RV/LV diameter ratio between any prior contrast-enhanced chest CT (of up to 5mm slice thickness) and a positive CTPA (of 1mm slice thickness) for acute PE improves prediction of 30-day mortality compared to the diameter ratio from the positive CTPA alone.

The study retrospectively examined 100 consecutive patients with a CTPA diagnosis of acute PE and prior contrast-enhanced chest CT. Of

those patients, 27 underwent CTPA, 2 had angiograms for suspected aortic dissection, and 71 had 5 mm slice thickness contrast-enhanced chest CTs.

Results showed that “an interval increase in the size of the right ventricle is significantly more accurate overall than right ventricular size alone for predicting mortality after acute PE,” said author Michael Lu, M.D., of the University of California, San Francisco.

and stenosis,” said Sebastian Leschka, M.D., a staff radiologist at the Institute of Diagnostic Radiology at the University Hospital Zurich in Switzerland. “An increase in radiation dose has paralleled advances in spatial and temporal resolution CT and improvements in diagnostic accuracy of CTCA.”

The goal for every examination using CTCA should be a reduction in radiation dose, said Dr. Leschka. For his study, dual-source CTCA was performed in 80 total patients of normal weight with suspected coronary artery disease. Forty patients were scanned with CTCA standard protocol, 120 kilovolts (kV), 330 mAs. Twenty patients were examined at 100 kV/330 mAs and another 20 at 100 kV/220 mAs. Two observers independently assessed each coronary segment. Diagnostic image quality was obtained in 99 percent of all coronary segments without significant differences among the three protocols.

“The image noise was higher in both 100 kV CTCA protocols,” said Dr. Leschka. “Radiation dose savings of up to 50 percent could be achieved when reducing both tube voltage and tube

current in CTCA without impairing the subjective image quality.”

There were some surprises when comparing both 100 kV CTCA protocols, he said. “The increase in image noise and decrease in the contrast-to-noise ratio were not significant when the tube current was lowered,” he said. “This might indicate an overexposure of radiation in the protocol with 100 kV and higher tube current because image quality parameters are only improved to a minor extent.”

Since completion of the study, Dr. Leschka said all CTCA exams at the University Hospital Zurich in patients of normal weight are routinely performed with a 100 kV and tube current time product of 220 mAs.

A follow-up study has determined the radiation doses and image quality of different dual source CTCA protocols tailored to patient-specific parameters, such as heart rate and body mass index in a large number of consecutive patients, Dr. Leschka added. “The combined application of low kilovoltage in normal weighted patients and prospectively ECG-gated CTCA in patients

with a heart rate below 70 beats per minute resulted in a dose saving of up to 86 percent while maintaining the diagnostic image quality of the exam,” he said. □

Learn More

The abstracts for studies presented at RSNA 2008 are available online.

- **“Realistic Risks of Radiation-induced Cancer in a Clinical Patient Population Undergoing Cardiac CT”**

RSNA2008.RSNA.org/event_display.cfm?em_id=6007121

- **“Image Quality Parameters and Radiation Dose in Low Kilovoltage Cardiac Dual-Source CT”**

RSNA2008.RSNA.org/event_display.cfm?em_id=6019823

In addition, the abstract for “Estimated Radiation Dose Associated with Cardiac CT Angiography,” published in the Feb. 4, 2009, issue of *The Journal of the American Medical Association*, is available at jama.ama-assn.org/cgi/content/short/301/5/500.

■ Note: These articles were adapted from stories that appeared in the RSNA 2008 *Daily Bulletin*. Daily newspapers from the annual meeting are available online at RSNA.org/bulletin.

**Daily
Bulletin**

Photos Increase Radiologist-Patient Connection

SEEING A patient's face in a photograph alongside a CT study prompts radiologists to give a more meticulous reading, according to a study presented at RSNA 2008.

"Including a patient photograph with the CT exam increased both the length of the report and the rate of reported incidental findings," said presenter Yehonatan Turner, M.D., a radiology resident at Shaare Zedek Medical Center in Jerusalem. Dr. Turner's study received significant mainstream media coverage during RSNA 2008.

For the study, 267 patients referred for CT agreed to be photographed before their examinations. Patient consent was obtained and oncologic or emergency cases were excluded. The photographs were added to the patients'

files on the department PACS among a total of 1,137 CT examinations performed at a single tertiary care hospital in January 2008. The photos appeared automatically when the patient files were opened.

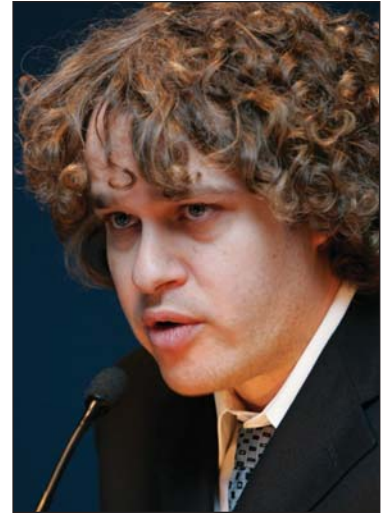
To assess the effect on interpretation, 30 examinations containing incidental findings from the study group

were shown again in a blinded fashion to the same radiologists three months later, without the patients' photographs.

Researchers examined the resulting reports, measuring the number of words in the report, number of incidental findings, the presence or absence of a summary section and the presence or absence of recommendation for care management. The 17 radiologists in the participating department also com-

It is important for radiologists to be aware that photographs represent a patient, not merely just another case.

Yehonatan Turner, M.D.



Yehonatan Turner, M.D.
Shaare Zedek Medical Center, Jerusalem

pleted a questionnaire in which they rated their experience with the photographs in the exams.

Comparisons with the 30 cases presented blindly revealed that 80 percent of previous incidental findings

Media Coverage of RSNA 2008

Dr. Yehonatan Turner's study of adding photographs to imaging studies was one of 13 news conferences held during RSNA 2008. More than 4,000 stories have been carried by print, broadcast and online media outlets, reaching an estimated 2.9 billion person audience.

News conferences held during the annual meeting resulted in coverage in such publications as *USA Today*, *Los Angeles Times* and *The Wall Street Journal*, as well as placement on broadcast outlets including CBS News, CNN Headline News and ABC Newsradio. Stories also appeared on such Web sites as *The New York Times* and *Washington Post* online editions.



A study on an emerging condition known as self-embedding disorder proved popular with the mainstream media at RSNA 2008. "Radiologists are in a unique position to be the first to detect self-embedding disorder, make the appropriate diagnosis and mobilize the healthcare system for early and effective intervention and treatment," said study principal investigator William E. Shiels II, D.O. (*at podium*), chief of the Department of Radiology at Nationwide Children's Hospital in Columbus, Ohio.

Sound Processing Differences in Autistic Children Draw Media Attention

A STUDY SHOWING that magnetoencephalography (MEG) can detect short but extremely significant delays in the ability of autistic children to process sound and language was also the subject of considerable media coverage during RSNA 2008.

"You hear a sound, and maybe a 10th of a second later there'll be a big burst of neuronal activity," said presenter Timothy Roberts, Ph.D., vice-chair of research in the Department of Radiology at Children's Hospital in Philadelphia. "That gets significantly and reproducibly delayed in children with autism. The delay is only a fraction of a second, about a 50th of a second, but we can capture that fraction very easily."

For the study, 64 children, ages six to 15, with a diagnosis of autism spectrum disorder along with a control group of typically developing children were evaluated with MEG. Audio stimulation was introduced to the children in the form of beeps, tones in pairs, vowels or sentences.

Sounds were presented at different frequencies and in tone pairs in rapid succession, including unusual streams of incongruous tones and vowels—for example, a "u" sound in a series of "a" sounds.

In the autistic children, there was a delay in the response of the superior temporal gyrus while processing the rapid succession sounds and the unusual streams. "These delays—fractions of seconds—don't sound like very much, but they're critically important when you consider every syllable we speak only lasts a quarter of a second," Dr. Roberts continued.

"Take the word 'elephant,'" he said. "If you're still dealing with the 'ele' and everyone else has moved on to the 'phant,' you can never catch up."

Because autistic children can have delays



Timothy Roberts, Ph.D.
Children's Hospital,
Philadelphia

in developing speech, said Dr. Roberts, learning more about how their brains process sound is vital to designing more effective therapies tailored to each child's individual profile.

"We expect these results may someday identify those who may be good candidates for intensive speech therapy and those who may be candidates for another type of therapy," he said. "There may be emerging therapies and this will help stratify the

patients. There's no such thing as one universal type of speech therapy.

"This is one way you'd be able to monitor the responsiveness, maybe before there's even any obvious behavioral response, because you'd be able to figure out whether the brain's actually processing the sound even if the child can't articulate a response," Dr. Roberts concluded.

were not reported when the photograph was omitted from the file. In their responses to the questionnaire, radiologists reported feeling more empathy for patients whose photos they saw, said Dr. Turner. "All radiologists involved reported that while the addition of the photograph did not lengthen the duration of the interpretation, it did render the interpretation more meticulous," he said.

Photos Make Each Scan Unique

Dr. Turner noted that radiologists surveyed agreed strongly with the statements "The patient photograph prompted me to relate in more detail to the CT" and "It enabled me to feel more of a physician." All those surveyed recommended adopting the practice to routine interpretation, he said.

"I think the most important statement they agreed with was that the photo makes each CT scan unique," said Dr. Turner, adding that including a photo could also be helpful in reducing patient identification errors. "The pho-

tographs also offered some additional medical information, such as signs of suffering or physical signs of disease—neurological signs, skin discoloration and hematoma," he said.

Dr. Turner acknowledged that routinely including photos in radiologic exams could invite interpretation bias on the basis of aesthetics—the radiologist could find the person attractive or unattractive. "However, that is relevant to all physician contact—physicians who meet patients face-to-face each day likely have those same biases," he said. "Our radiologists reported that attractiveness had no effect on their interpretation, but of course there is no way to measure that."

The idea for the study originated from realizing the different attitudes toward patients during ultrasound exams—performed by the radiologist—and CT exams, performed by the technologist, Dr. Turner explained. He noted that radiologists often review CT images at a later time or from remote locations and miss out on physician-

patient contact.

"The addition of a photograph enables a more personal approach to the interpretation, especially when the radiologist is not in physical contact with the patient," said Dr. Turner. "It is important for radiologists to be aware that radiographs represent a patient, not merely just another case." □

Learn More

The abstracts for studies presented at RSNA 2008 are available online.

- "The Effects of Including a Patient's Photograph to the Radiographic Examination"
RSNA2008.RSNA.org/event_display.cfm?em_id=6008880
- "Evaluation of Autism Spectrum Disorders Using Magnetoencephalography"
RSNA2008.RSNA.org/event_display.cfm?em_id=6022462

■ Note: These articles were adapted from stories that appeared in the RSNA 2008 *Daily Bulletin*. Daily newspapers from the annual meeting are available online at RSNA.org/bulletin.

**Daily
Bulletin**

RadiologyInfo™ Uses Sound to Amplify Success

FRESH FROM a usability study that ranked *RadiologyInfo.org* in the top 15 percent of more than 200 Web sites and earning a top award for health-related sites, coordinators of the patient information portal are looking to the future by adding audiovisual presentations and other tools to enhance the experience of site visitors.

Launched this month, clips pairing PowerPoint presentations with audio recordings offer *RadiologyInfo.org* users another medium for learning about radiology procedures, said Joseph H. Tashjian, M.D., RSNA representative co-chair of the RSNA-American College of Radiology (ACR) Public Information Web Site Committee.

“We believe that some people would rather watch a short video instead of reading information off a Web site,” said Dr. Tashjian, president of St. Paul Radiology in St. Paul, Minn. “We also know our short video clips are popular with many people.”

Created in 2000 as a first-of-its-kind joint RSNA project with ACR, *RadiologyInfo.org* continues to expand its successful formula of educating patients through a variety of creative and informative tools. This year, the committee plans to use the results of a 2008 usability assessment to guide revisions to the site’s content, design and navigation. In its evaluation, Web site development firm Imaginary Landscape rated *RadiologyInfo.org* eight or nine on a 10-point scale on most criteria. The company was especially impressed by the site’s search engine

optimization and recommended only one improvement: A design facelift.

“The company concluded that users found the site easy to navigate and full of good content, but recommended its look be updated,” said committee member James Donaldson, M.D., chair of the Department of Medical Imaging at Children’s Memorial Hospital in Chicago and the RSNA-ACR committee vice co-chair.

Along with past awards including the 2003 Association Trends All Media Gold Medal, *RadiologyInfo.org* was among the recipients of the 2008 Health Improvement Institute’s Aesculapius Award of Excellence for health-related Web sites.

Content Drives Success

In 2008 alone, almost 5.4 million people visited *RadiologyInfo.org*, which draws nearly 500,000 hits each month and increases its traffic by 25 percent

each year. Since going bilingual in 2005, the site averages more than 2 million page views per year in Spanish.

Content has increased dramatically, with more than 100 radiologic examina-

tions and treatments now posted and 15 to 20 new procedures added each year. More than 100 new medical terms were defined and added to the site’s glossary in 2008.

The site has grown so quickly in scope, size and reputation that the eight-member committee originally created to oversee its progress has



Joseph H. Tashjian, M.D.
St. Paul Radiology

expanded to 14 medical professionals.

The secret to the success of *RadiologyInfo.org*, according to committee members, is using simple, straightforward language the average person can understand. The site guides visitors through an A-Z listing of procedures explained in an easy-to-follow question-and-answer format that addresses what patients might experience in an exam and how to prepare. Procedures are illustrated in an image gallery.

While described in a simple way, the complex content is actually carefully reviewed by a committee of diagnostic radiologists, radiation oncologists, nuclear medicine physicians, interventional radiologists and a medical physicist.

Each member oversees a body system, such as chest or abdominal, in terms of Web site content. Categorized as diagnostic, interventional, nuclear medicine or radiation therapy, content includes everything from new procedures, terms and studies to images and news articles. Also included are

RADIOLOGYINFO™
The radiology information resource for patients
La fuente de información sobre radiología para pacientes

RSNA and ACR are dedicated to making RadiologyInfo.org an excellent Web site for patients ... it's a novel creation that's been working very well.

James Donaldson, M.D.

Radiology in Motion video cartoons—with clever titles like “The X-Ray Files”—originally designed by Walt Disney Studios and RSNA as part of a three-year EPCOT Center exhibit that debuted in the late 1990s.

Along with their knowledge of the issues, the committee considers content by tracking which subjects get the most visits and reviewing user feedback posted on the site’s user survey. Feedback has been overwhelmingly positive, according to the committee.

Posting new information quickly and accurately is important. Expert commentary on a *New England Journal of Medicine (NEJM)* study on radiation risk and CT scanning was posted on *RadiologyInfo.org* within two days after the *NEJM* article was published in 2007. Committee members put the article into what they considered the proper context, emphasizing key points for the public.

In 2008, the site posted an original article detailing the differences between observational studies and randomized, controlled trials. The article drew praise from National Cancer Institute Director John E. Niederhuber, M.D., who directed his media office to use the article as a model for explaining complex scientific concepts to the public.

The clinical trials article translates well to the average person because it was reviewed for clarity by people with no medical background, said Dr. Tashjian. “We’re beginning to have lay people review our Web site for understandability and this article was sent to several non-medical people,” he said. “Having their input helped that article immensely so that when we posted it, it was clear to the lay public.”

One of the site’s best promotional tools is its search engine optimization, said committee members. Search engines consistently



A new RadiologyInfo™ feature, “Your Radiologist Explains,” pairs PowerPoint presentations with audio recordings to offer users another medium for learning about radiology procedures. “Your Radiologist Explains” clips were launched this month for chest X-ray, pediatric radiology and abdominal CT, with more to come.

return *RadiologyInfo.org* at the top of millions of Google hits on keyword searches such as “radiology procedures” or “CT scan.” To ensure maximum search success, the site includes terms commonly known to the public but rarely used by physicians, such as CAT scan. “Most patients find the site through a search engine,” said Dr. Donaldson.

“Both RSNA and ACR are dedicated to making *RadiologyInfo.org* an excellent Web site for patients,” he said. “It’s actually a rewarding and productive way for the two societies to work together. It’s a novel creation that’s been working very well.” □

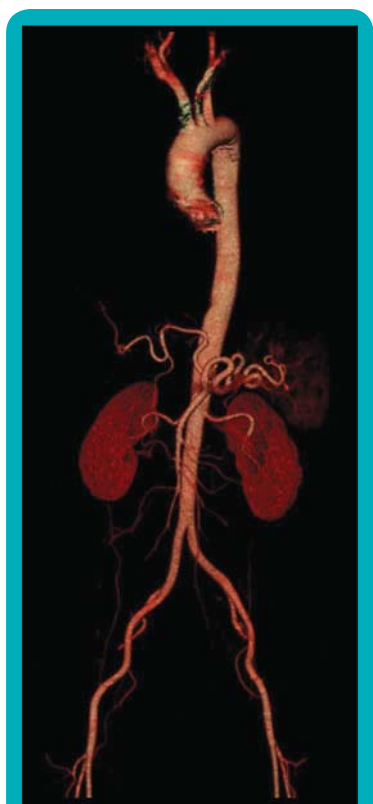


Image Contest Spurs New Content

Some of the new images users see on RadiologyInfo™ come courtesy of the Outstanding Image Contest conducted last year. Targeting residents, fellows and medical and physics students, the contest was designed to help bolster the number of quality images on the site and introduce *RadiologyInfo.org* to young medical professionals. Pictured is a CT angiogram submitted by Venu Vadlamudi, M.D., of Michigan State University.

For more information about the contest, go to www.radiologyinfo.org/contest.

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 Holger H. Woerner, M.D.
 Gerald M. Wyse, M.B.B.Ch.
 Masashi Yamashiro, M.D.
 Huei-mei & Wen C. Yang, M.D.
 Chin A. Yi, M.D., Ph.D.
 Muhammad A. Zaheer, M.D.
 Harry L. Zinn, M.D.

RSNA RESEARCH & EDUCATION FOUNDATION

Roentgen Resident/Fellow Research Award

Deadline for nominations—April 1

The RSNA Research & Education Foundation seeks nominations for the Roentgen Resident/Fellow Research award, designed to recognize and encourage outstanding residents and fellows in radiologic research. Each participating North American residency program will receive an award plaque with space to display a nameplate for each year's recipient. The Foundation will also provide a personalized crystal award for the department to present to the selected resident or fellow.

The residency program director or the department chair should identify one individual annually based on the following:

- Presentations of scientific papers at regional

- or national meetings
- Publication of scientific papers in peer-reviewed journals
- Receipt of a research grant or contributions to the success of a research program within the department
- Other research activities

Every resident/fellow in an Accreditation Council for Graduate Medical Education-approved program of radiology, radiation oncology or nuclear medicine is eligible. Nominations are limited to one resident or fellow per department per year.



Download the nomination form and view the complete list of 2008 award recipients at RSNA.org/Foundation/RoentgenResidentFellow_ResearchAward.cfm.

Journal Highlights

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

Renal Safety of Gadolinium-based Contrast Media in Patients with Chronic Renal Insufficiency

GADOLINIUM-BASED contrast medium (CM) has been associated with contrast medium-induced nephropathy (CIN) in patients with advanced renal disease. However, the bio- and physiochemical properties of the gadolinium-chelates responsible for such nephrotoxicity have not been clearly defined.

In a review article in the March issue of *Radiology* (RSNA.org/radiology), Elena Ledneva, M.D., of Hôpital Pitié-Salpêtrière in Paris, and colleagues survey available clinical studies to clarify the effects of gadolinium-based CM on renal function. The authors specifically discuss:

- Characteristics of gadolinium chelates
- Pharmacokinetics of gadolinium chelates in patients with normal renal function and in patients with renal insufficiency (RI)

- Probable mechanisms of nephrotoxicity of CM
- Renal safety of gadolinium-based CM in patients with normal renal function
- Renal toxicity of gadolinium-based CM in patients with RI

Gadolinium chelates appear to be nonnephrotoxic as intravenous CM for MR examinations in subjects with normal renal function, as well as those with preexisting RI when used in doses similar to those recom-

mended to MR imaging, Dr. Ledneva and colleagues conclude.

"However, deterioration in renal function may occur in the majority of cases after intraarterial administration of gadolinium-based CM used at doses higher than 0.2 mmol/kg for diagnostic or interventional angiographic procedures in patients with renal insufficiency," they write.

Radiology

E-TOCs Alert Members to Future Journal Articles

In mid-March, RSNA members will begin receiving e-mail messages alerting them to future tables of contents for *Radiology* and *RadioGraphics*. The E-Table of Contents (E-TOCs) will give members a preview of articles to come, with links to abstract summaries.

Members can customize their alerts by choosing keywords or topics of interest. To customize, go to radiology.rsna.org/cgi/alerts or radiographics.rsna.org/cgi/alerts. Recipients can opt out of receiving E-TOCs by clicking the "Unsubscribe" button at the bottom of the message.

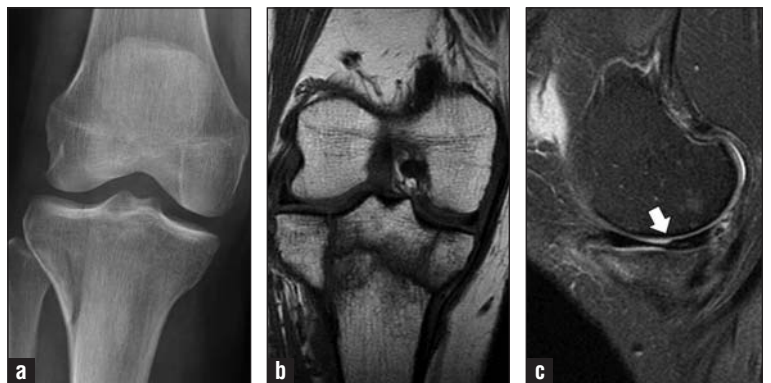
Schatzker Classification of Tibial Plateau Fractures: CT and MR Imaging Improve Plain Radiographic Assessment

ALTHOUGH THE Schatzker classification system for tibial plateau fractures is widely used to assess the initial injury, plan management and predict prognosis, studies have reported that initial

Schatzker rankings and surgical plans based on plain radiographic findings were modified after preoperative CT or MR imaging.

In an article in the March-April issue of *RadioGraphics*, (RSNA.org/radiographics), B. Keegan Markhardt, M.D., Jonathan M. Gross, M.D., and Johnny U.V. Monu, M.D., from the University of Rochester Medical Center, describe the added benefit of CT and MR imaging for correct characterization of tibial plateau fractures, discuss how fracture management and outcome change with each fracture

RadioGraphics



Four-part fracture in a 41-year-old woman who was involved in an altercation.

(a) Plain radiograph shows a split fracture of the lateral tibial plateau. Initially, the fracture was treated conservatively with absence of weight bearing. MR imaging was performed because of continued pain and swelling and clinical suspicion of a meniscal or ligamentous injury. (b) Sagittal proton-density-weighted MR image shows an unsuspected nondepressed four-part fracture of the tibial plateau. (c) Sagittal T2-weighted MR image shows contour irregularity and abnormal high signal intensity of the medial meniscus (arrow), findings compatible with a tear.

(*RadioGraphics* 2009;29:585-597) © RSNA, 2009. All rights reserved. Printed with permission.

Continued on Page 20

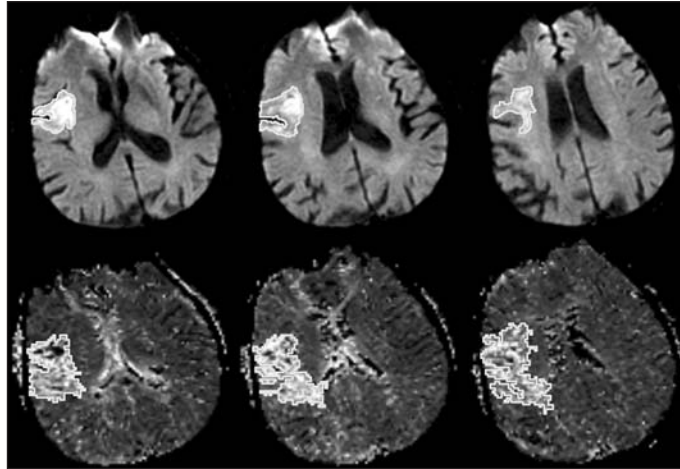
Radiology in Public Focus

Press releases have been sent to the medical news media for the following articles appearing in the March issue of *Radiology* (RSNA.org/radiology):

Existence of the Diffusion-Perfusion Mismatch up to 24 Hours After Onset of Acute Stroke: Dependence Upon Proximal Arterial Occlusion

DIFFUSION-PERFUSION mismatch commonly persists longer than nine hours after a stroke and occurs most often in patients with proximal arterial occlusion (PAO), researchers have found.

Intravenous thrombolysis is currently administered only to patients who present less than three hours after symptom onset with lesion mismatch on diffusion- and perfusion-weighted MR. William A. Copen, M.D., of Massachusetts General Hospital, and colleagues studied 109 patients who underwent diffusion-weighted and perfusion-weighted imaging within 24 hours of stroke onset. CT or MR angiography distinguished patients with PAO from those without PAO. Researchers found



Diffusion-perfusion mismatch in a 76-year-old man imaged 5.7 hours after onset of left-sided weakness and dysarthria.

Top row: Selected transverse diffusion-weighted images. Bottom row: Mean transit time maps. Measurement of the volumes of the lesions, only portions of which are shown here, demonstrated a 340 percent diffusion-perfusion mismatch.

(*Radiology* 2008;250:878-886) © RSNA, 2009. All rights reserved. Printed with permission.

that while patients without PAO demonstrated decreasing eligibility for thrombolysis over time after stroke onset, patients with PAO demonstrated increasing eligibility and showed no significant difference before and more than nine hours following onset.

“For institutions not capable of performing diffusion- and perfusion-weighted imaging on acute stroke

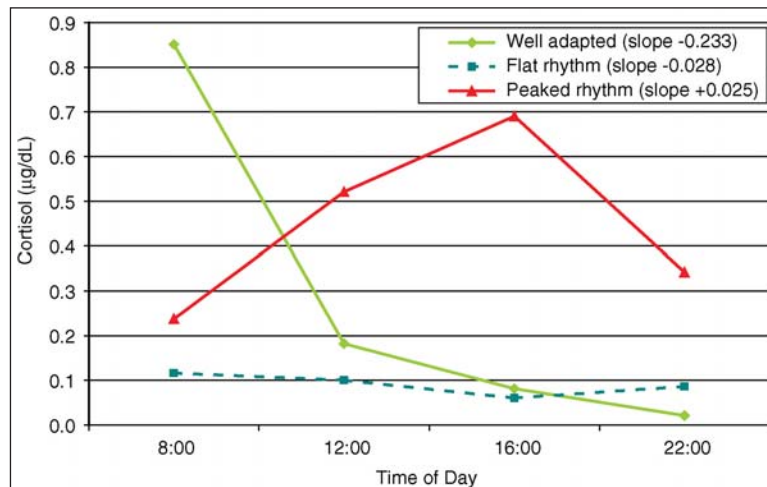
patients, the current findings suggest that patients who are scanned after nine hours and have PAO seen on CT angiography or MR angiography may be more likely to have a significant quantity of persistently threatened-but-salvageable brain tissue, and therefore may be more likely to benefit from thrombolysis,” the researchers stated.

Large-Core Breast Biopsy: Abnormal Salivary Cortisol Profiles Associated with Uncertainty of Diagnosis

ANXIETY associated with waiting for histology results after large core breast biopsy can adversely affect biochemical stress levels, researchers have discovered.

“Diurnal salivary cortisol profiles of women who have not heard their diagnoses by day five after large core breast biopsy are abnormal to a degree that is indistinguishable from women who have learned that they have malignant disease,” wrote Elvira V. Lang, M.D., of Beth Israel Deaconess Medical Center,

Continued on next page



Examples of daily cortisol profiles.

Green line represents well-adapted slope of $\mu 0.233 \ln (\mu\text{g/dL})/\text{hr}$. Red line is example of peaked rhythm, with slope of $+0.025 \ln (\mu\text{g/dL})/\text{hr}$. Teal (*dashed*) line is example of flat rhythm, with slope of $\mu 0.028 \ln (\mu\text{g/dL})/\text{hr}$.

(*Radiology* 2008;250:631-637) © RSNA, 2009. All rights reserved. Printed with permission.

Radiology in Public Focus

Large-Core Breast Biopsy: Abnormal Salivary Cortisol Profiles Associated with Uncertainty of Diagnosis

Continued from previous page

and colleagues at the University of Iowa.

The 150 women in the study group learned of their diagnoses one to six days after biopsy. Cortisol slopes of the women with uncertain diagnoses were significantly flatter—less desirable—than those of women who learned

earlier that they had benign disease and were not significantly different from those who learned earlier that they had malignant disease.

Distress associated with knowledge of biopsy results or lack thereof is reflected in abnormal salivary cortisol profiles, the researchers note. “Uncer-

tainty about the final diagnosis is associated with significant biochemical distress which may have adverse effects on immune defense and wound healing,” they write. “This supports calls for more rapid provision of biopsy results.”

Media Coverage of Radiology

In January, media outlets carried 136 news stories generated by articles appearing in *Radiology*. These stories reached an estimated 55 million people.

Coverage included HealthScout News, Asian News International, *Radiology Today*, *General Practitioner*, *Health & Medicine Week*, *Obesity, Fitness & Wellness Week*, *Women’s Health Weekly*, *ABCNews.com*, *MedLinePlus.com*, *ScienceDaily.com*, *Auntminnie.com*, *HealthImaging.com* and *drkoop.com*.

Learn about media coverage of RSNA 2008 on Page 12.

March Public Information Activities Focus on Colorectal Cancer

To highlight National Colorectal Cancer Awareness Month in March, RSNA will distribute radio public service announcements (PSAs) encouraging listeners to be screened for colorectal cancer.

In addition, RSNA will distribute the “60-Second Checkup” audio program to nearly 100 radio stations across the U.S. The segments will focus on the *RadiologyInfo.org* patient information site and also address colorectal cancer topics including early detection of colorectal cancer and the use of virtual colonoscopy.

Schatzker Classification of Tibial Plateau Fractures: CT and MR Imaging Improve Plain Radiographic Assessment

Continued from Page 18

type and detail the six types of the Schatzker classification system:

- Lateral tibial plateau fracture with and without depression
- Compression fracture of the lateral or central tibial plateau

- Medial tibial plateau fracture
- Bicondylar tibial plateau fracture
- Tibial plateau fracture with diaphyseal discontinuity

“CT and MR imaging are more accurate than plain radiography for Schatzker characterization and clas-

sification of tibial plateau fractures and use of cross-sectional imaging can improve surgical planning,” the authors conclude.

This article meets the criteria for 1.0 AMA PRA Category 1 Credit.

RSNA MEMBER BENEFITS

RSNA Visits SMRI

The biannual meeting of the Sociedad Mexicana de Radiología e Imagen (SMRI) was held in February in Mexico City. 2008 RSNA President Theresa C. McLoud, M.D. (left, in top left photo), received honorary membership from SMRI President Luis Alva, M.D. Also attending the meeting was RSNA Interim Executive Director Mark G. Watson (right, in bottom left photo), who spent time with Jorge A. Soto, M.D., of Boston University.



Working For You

Associated Sciences Consortium

RSNA News continues its series highlighting the work of organizations working with RSNA in the Associated Sciences Consortium.

Radiology Business Management Association

RESOURCES created by members for members make the Radiology Business Management Association (RBMA) a valuable source of collective knowledge, said executive director Michael R. Mabry.

“Our members serve radiology practices—they’re the practice managers, the CEOs, the CFOs,” Mabry said. “We provide the resources to make those practices excellent.”

In addition to education in the form of live conferences, webinars and audio conferences, RBMA members gain useful information through one-on-one communication with their colleagues, said Mabry. “There really is a sense of community,” he said. “Members will call and say, ‘I had a question, so I picked up the phone and called So-and-So, because they’ve gone through it too.’”

Members can also glean information from RBMA’s practice management forums and listservs, finding advice on

issues ranging from getting reimbursement from a difficult payor to installing a new PACS.

RBMA’s diverse membership contributes a broad range of perspectives, said Mabry. “We service the entire spectrum of radiology business professionals, from the coder who processes the claims all the way up to the most senior non-physician member of the practice and the radiologist,” he said.

RBMA was founded by a radiologist in 1968 to address the implementation of Medicare and the designation of radiology as a specialty. “At that time, radiologists were basically employees of hospitals—indistinguishable from all the other hospital-based specialties,” Mabry said. “With radiology becoming separate, radiologists had to go out and learn how to bill and collect and manage their own practices. RBMA has helped

radiology to become an independent, financially self-sustaining industry.”

Relocating from California to Fairfax, Va., in 2007 brought RBMA closer to Congress and the Centers for Medicare & Medicaid Services (CMS), said Mabry said. “One of our newer initiatives is to communicate more with CMS and Congress about

issues on the practice side of radiology, and provide more information to our members about what’s happening on Capitol Hill,” he said. “We’re evolving an advocacy agenda and an advocacy voice.

“RBMA exists so that radiologists can focus on patient care and leave running their practices to professional managers,” Mabry concluded. “Radiologists can be confident that their practices are in the good hands of a manager who is an RBMA member.”



Grant Writing Skills Sharpened

More than two dozen people worked to improve their chances of receiving research funding with writing workshops held recently at RSNA Headquarters at Oak Brook, Ill.

The **Writing a Competitive Grant Proposal** program helps researchers in radiology, radiation oncology, nuclear medicine and related sciences actively pursue federal funding. The hands-on course focuses on developing realistic expectations of and tools for getting started on the grant process.

The **Advanced Course in Grant Writing**, consisting of four 2-day sessions held over a nine-month period, guides M.D. or Ph.D. faculty members in radiology, radiation oncology and nuclear medicine in preparing and submitting a quality grant application to the NIH, NSF or other equivalent institution.



News about RSNA 2009

Submit Abstracts for RSNA 2009

THE ONLINE SYSTEM to submit abstracts for RSNA 2009 is now open. **The submission deadline is 12:00 p.m. Central Time on April 15, 2009.** Abstracts are required for scientific papers, scientific posters and education and applied science exhibits.

To submit an abstract online, go to RSNA.org/abstracts. For more information about the abstract submission process, contact the RSNA Program Services Department at 1-877-776-2227 within the U.S. or 1-630-590-7774 outside the U.S.



Abstract Awards

Trainee Research Prize

Resident/physics trainees, fellows and medical students from North America who submit abstracts for RSNA 2009 will be eligible for a Trainee Research Prize. Submissions will undergo the usual peer-review process and, if accepted for presentation, the authors will receive a letter of invitation to submit a 2,000-word abstract for consideration for the Trainee Research Prize.

A prize certificate and \$1,000 are presented to the recipient during the scientific session in which the award-winning paper or poster is given.

Travel Awards for Young Investigators in Molecular Imaging

RSNA will assist with travel expenses for up to 15 young investigators whose molecular imaging abstracts are accepted for presentation at RSNA 2009.

To be eligible, an abstract presenter or poster exhibitor must have been awarded his or her doctoral degree no more than seven years prior to the time of abstract submission. The recipient must personally attend RSNA 2009 to present his or her work.

Notifications of abstract acceptance and travel awards will be made simultaneously.

International Visitors

Start Visa Process Now

Personalized letters of invitation to RSNA 2009 are available for request at RSNA2009.RSNA.org. Click International Visitors. This section of the annual meeting Web site also includes important information about the visa application process. It is recommended

that international annual meeting attendees start the visa process now.

Access more visa information at www.unitedstatesvisas.gov, travel.state.gov/visa and nationalacademies.org/visas

Travel Approval Required for Visa Waiver Countries

The U.S. Department of Homeland Security (DHS) reminds travelers from all Visa Waiver Program (VWP) countries that they are now required to obtain approval through the Electronic System for Travel Authorization (ESTA) prior to traveling to the U.S.

ESTA is a Web-based system that determines the preliminary eligibility of visitors to travel under the VWP prior to boarding a carrier to the U.S. More than 99.6 percent of applicants have been approved, most within seconds, according to DHS. Access the ESTA system at esta.cbp.dhs.gov.

Important dates for RSNA 2009

April 15	Deadline for abstract submission
April 29	RSNA/AAPM member registration and housing open
May 27	Non-Member registration and housing open
June 30	Course enrollment opens
October 23	International deadline to have full-conference badge mailed in advance
November 6	Final advance registration, housing and course enrollment deadline
Nov. 29 – Dec. 4	RSNA 95th Scientific Assembly & Annual Meeting

Registration Fees

BY 11/6	ONSITE	
\$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
\$150	\$250	Non-Member Resident/Trainee
\$150	\$250	Radiology Support Personnel
\$680	\$780	Non-Member Radiologist, Physicist or Physician
\$680	\$780	Hospital or Facility Executive, Commercial Research and Development Personnel, Healthcare Consultant and Industry Personnel
\$300	\$300	One-day registration to view only the Technical Exhibits

■ For more information about registering for RSNA 2009, visit RSNA2009.RSNA.org, e-mail reginfo@rsna.org or call 1-800-381-6660 x7862.

Program and Grant Announcements

RSNA Introduction to Research for International Young Academics

Deadline for Nominations—April 15

The RSNA Introduction to Research for International Young Academics program encourages young radiologists from countries outside the U.S. and Canada to pursue careers in academic radiology. The program consists of a special seminar held during the RSNA annual meeting.

Eligible candidates are residents and fellows currently in radiology training programs or radiologists not more than two years out of training who are beginning or considering an academic career. Nominations must be made by the candidate's department chairperson or training director. Fluency in English is required. Nomination forms can be found at RSNA.org/IRIYA.



World Congress on Interventional Oncology

June 25–28 • Beijing International Convention Center, China

The World Congress on Interventional Oncology (WCIO) will provide a scientific and educational forum where international experts from multiple disciplines can advance the future of cancer therapy by exploring the potential combination of minimal invasive strategies with traditional and other new therapeutic procedures.

WCIO welcomes all oncology specialists who are interested in learning more about collaborating with other specialties in caring for patients using image-guided technology. In addition to the scientific sessions, a technical exhibition will be offered.

RSNA is represented on the WCIO planning committee. For more information about WCIO, go to www.chinamed.com.cn/wcio2009.

RSNA Clinical Trials Methodology Workshop

January 9–15, 2010 • Hyatt Regency Scottsdale, Arizona • Applications due June 8

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 entrance into the course. Once admitted, trainees will participate in advance preparation, didactic sessions, one-on-one mentoring, small discussion sessions, self-study and individual protocol development. Familiarity with basic concepts and techniques of statistics and study design is required of all applicants.

Applications are available online at RSNA.org/CT2010. For more information, contact Fiona Miller at 1-630-590-7741 or fmiller@rsna.org.

RSNA-Sponsored Sessions at the Association of University Radiologists (AUR) Annual Meeting

May 12–15 • Marriott Crystal Gateway Hotel, Arlington, Va.

MERC Workshop

Part of the Association of American Medical Colleges (AAMC) Medical Education Research Certificate (MERC) Program, this workshop is targeted to clinicians and other educators who want to learn research skills enabling collaborative participation in medical education research projects.

More information about all sessions is available at www.AUR.org.

RSNA Medical Imaging Resource Center (MIRC®) Session

“Introduction to RSNA’s Teaching File Software: A Do-It-Yourself Guide to Setting It Up, Capturing Cases or Simply Using It for Board Review” will be presented by Eliot Siegel, M.D., Micah Adams, B.A., Naomi Saenz, M.D., and Tara Morgan, M.D.

Also at AUR, Catherine C. Roberts, M.D., will moderate the AUR-RSNA Quality Keynote, presented by Stephen J. Swensen, M.D., and Kevin B. Weiss, M.D., M.P.H.

RSNA Eyler Editorial Fellowship

Application Deadline—May 1

Candidates are sought for the RSNA Eyler Editorial Fellowship, sponsored by the RSNA Publications Council and the Committee on International Relations and Education (CIRE).

Named after William R. Eyler, M.D., a former editor of *Radiology*, the fellowship is designed to provide an opportunity for a mid-career radiologist to further his/her experience in radiologic journalism. Working with the editors of *Radiology* and *RadioGraphics* and RSNA publications staff, the fellow will learn about manuscript preparation, peer review, manuscript editing, journal production, printing and electronic publishing.

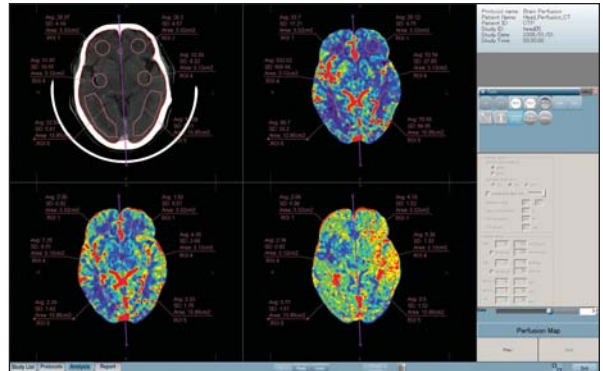
For more information regarding eligibility requirements and to apply, go to RSNA.org/Publications/editorial_fellowships.cfm.

Product News

FDA CLEARANCE

CT Brain Perfusion Software

Ziosoft, Inc. (www.ziosoftinc.com) has received FDA clearance for its CT brain perfusion application for its ZioStation system. The new application provides brain perfusion functionality to clinicians as a thin-client application using standard commercial hardware. The software aids radiologists in stroke assessment by providing a color map of cerebral blood flow and other perfusion-related parameters from CT images of the brain. It includes image manipulation tools as well as measurement tools such as cerebral blood volume, blood flow and mean transit time.



NEW PRODUCT

Digital Image Viewing for iPhone™

Merge Healthcare (www.merge.com) has launched its Merge Mobile™ for the iPhone™, which enables patients and healthcare professionals to view digital medical images such as CT, MR and X-ray on an Apple iPhone or iPod® Touch. A demonstration is available free of charge from the iPhone App Store.



Merge Mobile incorporates advanced remote rendering techniques, including multiplanar reconstruction, which eliminate downloading of large data quantities to the mobile device and enable almost immediate access to images.

FDA CLEARANCE

Digital Specimen Radiography

Kub Technologies (www.kubtec.com) has received FDA clearance for its XPERT 20 digital specimen radiography system. Designed exclusively for the biopsy suite, the XPERT 20 is available with either a 50 mm x 50 mm or 100 mm x 50 mm detector in a self-contained, shielded cabinet X-ray system that takes up less space than a PC monitor. A small focal spot X-ray source—of up to 25 kV and 1.0 mA—provides increased visibility and sharpness of detail for lesions and abnormalities in breast tissue samples.

FDA CLEARANCE

3D Cardiac CT Analysis

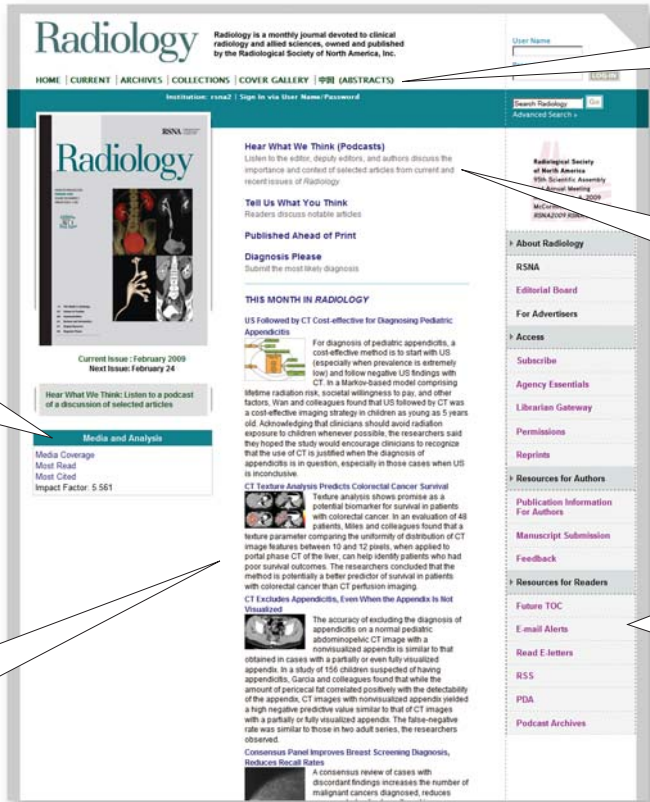
THE V3D-Cardiac module by Viatronix (www.viatronix.com) has received FDA clearance. The application combines left ventricle and coronary analysis functions into a single module. Since both functions are analyzed in a single application, the physician can now choose from any of the multiple phases when performing a coronary analysis. The module easily integrates with any PACS workstation with no need for any manual post-processing manipulation. It features one-click segmentation of the heart and selection and analysis of the coronary vessels, allowing real-time analysis of cardiac CT data.



RSNA.org

Radiology Home Page Gets Makeover

Online innovations continue on the *Radiology* home page at RSNA.org/radiology, with changes to content, design and navigational tools.



A link to **abstracts in Chinese** can now be found at the top of the page.

A link to “**Hear What We Think**” podcast discussions of current *Radiology* articles can be found at the top of the center column.

Informational links are now organized in an expanding drop-down menu on the right-hand side of the page. New links include a **Podcast Archive**.

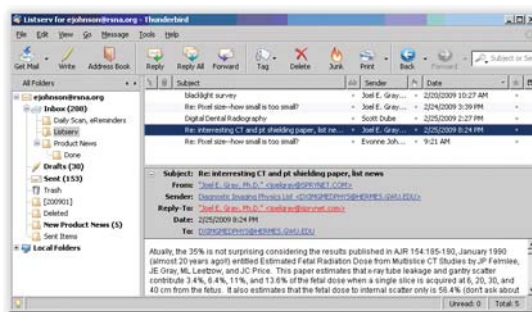
A new **Media and Analysis** content box includes links to **Most Read** and **Most Cited** articles along with *Radiology's* **Impact Factor**.

Also new to the page is the popular **This Month in Radiology**. Users can now link to abstracts of the featured articles directly from the homepage.

OTHER WEB NEWS

List Server Hosts Discussions of Medical Imaging Physics

A LIST SERVER recently launched at George Washington University in Washington provides a real-time forum for discussions in medical imaging physics topics. The service is free for anyone in diagnostic, therapeutic, nuclear medicine and health physics, as well as radiologists interested in imaging physics. The list server enables radiologists to pose questions to the group, consult with medical imaging physicists and contribute to discussion forums. More than 360 members worldwide have joined discussions on topics such as the usefulness of drape shielding for chest CT, how small is “too small” for pixel size, blacklight surveys for mammography artifacts and fusing CT and MR scan results. Those interested can sign up by sending an



e-mail message with the subject line “Subscribe DXIMGMEDPHYS” followed by first and last name or e-mail Bill Davros, Ph.D., adjunct professor of radiology at the Cleveland Clinic, at DAV-ROSB@ccf.org.

connections

Your online links to RSNA

RSNA.org

myRSNA®
RSNA.org – click My RSNA

Radiology Online
RSNA.org/radiology

RadioGraphics Online
RSNA.org/radiographics

RSNA News
rsnanews.org

Membership Applications
RSNA.org/mbrapp

RSNA Membership Directory
RSNA.org/directory

Education Portal
RSNA.org/education

RSNA CME Credit Repository
RSNA.org/cme

CME Gateway
CMEgateway.org

International Radiology Outreach Resources
RSNA.org/International/IROR.cfm

InterOrganizational Research Council
radresearch.org

RSNA Medical Imaging Resource Center
RSNA.org/mirc

RSNA Career Connection
RSNA.org/career

RadiologyInfo™
 RSNA-ACR patient information Web site radiologyinfo.org

RSNA Press Releases
RSNA.org/media

RSNA Research & Education (R&E) Foundation
 Make a Donation RSNA.org/donate

Silver Anniversary Campaign
RSNA.org/campaign

Community of Science
RSNA.org/cos

CQI Initiative
RSNA.org/quality

Resident Learning Portfolio
RSNA.org/myportfolio

RSNA 2009
RSNA2009.RSNA.org

Abstract Submission
RSNA.org/abstracts

CALENDAR

Medical Meetings April – June 2009

APRIL 2-5

American Institute of Ultrasound in Medicine (AIUM), Annual Meeting, Marriott Marquis, New York • www.aium.org

APRIL 4-8

Healthcare Information and Management Systems Society (HIMSS), Annual Conference and Exhibition, Chicago • www.himssconference.org

APRIL 18-24

International Society for Magnetic Resonance in Medicine (ISMRM), 17th Scientific Meeting and Exhibition, Honolulu • www.ismrm.org

APRIL 21-25

Society for Pediatric Radiology (SPR), 52nd Annual Meeting, La Costa Resort and Spa, Carlsbad, Calif. • www.pedrad.org

APRIL 23-26

Canadian Association of Radiologists (CAR), 72nd Annual Meeting, Marriott Château Champlain, Montréal • www.car.ca

APRIL 24-26

American Osteopathic College of Radiology (AOCR), Multi-Disciplinary Approach to Cancer Imaging, Royal Park Hotel, Rochester, Mich. • www.aocr.org

APRIL 25-29

American Radium Society (ARS), Annual Meeting, Four Seasons Vancouver, British Columbia • www.americanradiumsociety.org

APRIL 26-29

Society of Breast Imaging (SBI), 9th Postgraduate Course, The Broadmoor, Colorado Springs, Colo. • www.sbi-online.org

APRIL 26-MAY 1

American Roentgen Ray Society (ARRS), Annual Meeting, John B. Hynes Veterans Memorial Convention Center, Boston • www.rrs.org

APRIL 27-29

International Atomic Energy Agency (IAEA), International Conference on Advances in Radiation Oncology, Vienna International Centre, Austria • www.iaea.org

APRIL 30-MAY 1

SNM/RSNA, Symposium on Multimodality Cardiovascular Molecular Imaging, National Institutes of Health, Bethesda, Md. • www.snm.org/cvmi2009

MAY 1-2

French and Latin American Congress of Radiology, Transamerica Expo Center, São Paulo, Brazil • www.spr.org.br/jpr2009

MAY 2-5

American College of Medical Physics (ACMP), 26th Annual Meeting, Westin Virginia Beach Town Center, Virginia • www.acmp.org/meetings/09AM

MAY 2-6

American College of Radiology, Annual Meeting and Chapter Leadership Conference, Hilton Washington, D.C. • www.acr.org

MAY 12-15

Association of University Radiologists (AUR), Annual Meeting, Crystal Gateway Marriott, Arlington, Va. • www.aur.org

MAY 16-21

American Society of Neuroradiology (ASNR), 47th Annual Meeting, Vancouver Convention and Exhibition Center, British Columbia • www.asnr.org

MAY 30-JUNE 2

2nd World Congress of Thoracic Imaging and Diagnosis in Chest Disease, Valencia Conference Centre, Spain • www.geyseco.es/thoracicimaging.htm

MAY 31-JUNE 2

American Brachytherapy Society (ABS), Annual Meeting Westin Harbour Castle Hotel, Toronto • www.americanbrachytherapy.org

JUNE 2-5

Latin American Association of Radiation Oncology Therapy (ALATRO), 2nd Congress, Cancún, México • www.alatro.org

JUNE 4-7

Society for Imaging Informatics in Medicine (SIIM), Annual Meeting, Charlotte Convention Center, North Carolina • www.siim2009.org

JUNE 13-17 VISIT THE RSNA BOOTH

Society of Nuclear Medicine (SNM), 56th Annual Meeting, Metro Toronto Convention Center, Canada • www.snm.org

NOVEMBER 29-DECEMBER 4

RSNA 2009, 95th Scientific Assembly and Annual Meeting, McCormick Place, Chicago • RSNA2009.RSNA.org