



Radiology's Critical Role in the Diagnosis of Child Abuse

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Examining Benefit/Risk Ratios in Breast Screening
Stress and Burnout in Radiology
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Socioeconomic Factors May Impact Access to Imaging

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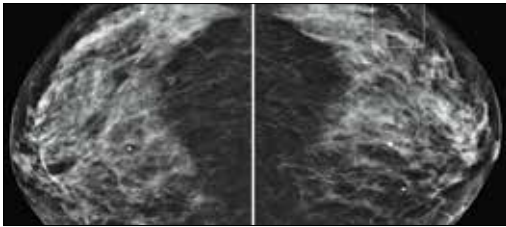


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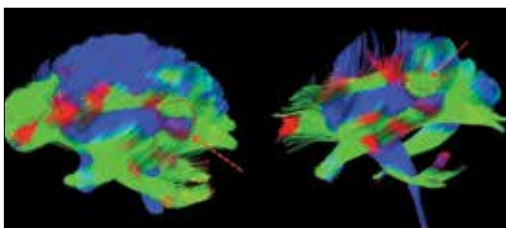


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Distinguished Honorees

The RSNA Board of Directors has announced the distinguished award recipients to whom the Society will pay tribute at the 102nd Scientific Assembly and Annual Meeting.

Outstanding Educator



Kristen K. DeStigter, MD
Burlington, Vt.

Outstanding Researcher



Clifford R. Jack Jr., MD
Rochester, Minn.

Last Call to Nominate *Radiology* Articles for the 2016 Margulis Award

The Nominating Committee for the Alexander R. Margulis Award for Scientific Excellence is accepting nominations from readers for *Radiology* articles published between July 2015 and June 2016. The main selection criteria are scientific quality and originality. Please send your nomination, including the article citation and a brief note highlighting the reasons for the nomination, to Pamela Lepkowski, assistant to the editor, plepkowski@rsna.org. The deadline for nominations is June 10.

Mannino Named Chief of Radiology at Peconic Bay Medical Center

Thomas F. Mannino, MD, was recently appointed chief of radiology and associate chief medical officer at Peconic Bay Medical Center in Riverhead, N.Y.

After receiving his medical degree from Stony Brook School of Medicine in 1990, Dr. Mannino completed his residency training in radiology at Stony Brook University Hospital in 1995, followed by his fellowship in nuclear medicine at Yale New Haven Hospital in 1996. More recently, Dr. Mannino completed his master's in healthcare delivery science at the Tuck School of Business and the Geisel School of Medicine at Dartmouth College in 2015.



Mannino

ACCME Extends RSNA Accreditation For Another Six Years

The Accreditation Council for Continuing Medical Education (ACCME) extended ACCME Accreditation with Commendation for RSNA until March 31, 2022. ACCME accreditation is necessary for RSNA to provide CME credits for physicians through the annual meeting and various programs.

ACCME Accreditation with Commendation is awarded to providers that demonstrate compliance in all criteria and the accreditation policies. The extension resulted from an arduous review process by RSNA of documenting adherence to the standards set by ACCME for

quality continuing medical education.

"It goes without saying that this accomplishment is a result of the dedication of a great number of our members who contribute their time, expertise and leadership which, in the words of the ACCME, make RSNA a learning organization and change agent for the physicians and patients we serve," RSNA Executive Director Mark Watson said.

ACCME also noted RSNA demonstrated an engagement with its environment in support of physician learning and change that is part of a system for quality improvement.

Numbers in the News

5

The percentage of radiology appointments that resulted in Missed Care Opportunities — or "no-shows" — in a study of 1 million radiologic examinations at Massachusetts General Hospital in 2014. Read about research examining the impact socioeconomic factors have on missed appointments on [Page 9](#).

4

The number of legacy giving options available to help support the RSNA Research & Education (R&E) Foundation's future work. Read about the new RSNA website designed to make gift planning easier on [Page 24](#).

10

Radiology's ranking among 26 medical specialties surveyed about their level of burnout and stress in a 2016 *Medscape* report. Read more about the reasons behind stress and burnout in radiology — and achieving a work-life balance on [Page 11](#).

14

Number of hours of audio-visual material available through RSNA's *Essentials of Radiology* — content previously only available at the RSNA annual meeting. Read more on [Page 21](#).

To read full First Impression biographies, go to RSNA.org/News.

ASSR Awards Gold Medal to Wong

The American Society of Spine Radiology (ASSR) presented a gold medal to **Wade H. Wong, DO**, at its recent annual meeting in Bonita Springs, Fla.

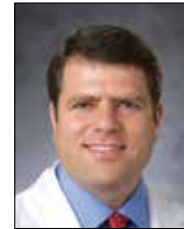


Wong

Kirsch Receives NCI Outstanding Investigator Award

David G. Kirsch, MD, PhD, recently received an Outstanding Investigator Award from the National Cancer Institute (NCI). Dr. Kirsch received a Philips Medical Systems/RSNA Holman Pathway Research Resident Seed Grant from the Research & Education (R&E) Foundation in 2004 for his study, "Combining Anti-Angiogenesis Therapy with Radiation Therapy for the Treatment of Lung Cancer in Mice."

The \$6.6 million award from the NCI covers seven years and will fund Dr. Kirsch's ongoing research to improve the efficacy and safety of radiation therapy for people with cancer.



Kirsch

High Impact Clinical Trial Session Will Debut at RSNA 2016

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

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

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

HICT abstracts can be submitted beginning June 1. Deadline for submissions is Aug. 1 at noon Central Time. Authors of accepted submissions will be notified Aug. 15. For more information go to RSNA.org/AnnualMeeting.



Curran



Davis



Williams

Curran, Davis, Williams Awarded ACR Gold Medals

Walter J. Curran Jr., MD, Lawrence P. Davis, MD, and Charles D. Williams, MD, received gold medals at the recent American College of Radiology (ACR) annual meeting.

ACR bestowed honorary fellowships on **Peter J. Hoskin, MD, PhD**, of London, and **Christoph Laurenz Zollikofer, MD**, of Zurich, Switzerland.

RSNA 2015 Radiation Safety Education Exhibit Series Available on Image Wisely®

A curated series of radiation dose and safety education exhibits from RSNA 2015 now can be accessed from Image Wisely, an initiative of the RSNA, ACR, AAPM and ASRT to raise awareness and provide educational resources for medical professionals on the use of ionizing radiation in adult medical imaging examinations. Additional RSNA 2015 education exhibits will be posted over the next few months; access from ImageWisely.org is free and does not require login.



RSNA/AOSR Sponsor 2016 Joint Symposium

RSNA and the Asian Oceanian Society of Radiology (AOSR) are sponsoring a new program, the RSNA/AOSR Symposium, to be held at the Asian Oceanian Congress of Radiology (AOCR) from Aug. 19-21, 2016, in Beijing, and repeated at RSNA 2016 from Nov. 27-Dec. 2, 2016, in Chicago. Claude Sirlin, MD, and Byung I. Choi, MD, PhD, are organizing the event. For more information, go to aocr2016.org/cs/cms/aocr/index.jhtml.

RSNA® 2016



Member Spotlight

Daniel I. Glazer, MD

Daniel I. Glazer, MD, completed his radiology residency at the University of Michigan, followed by a fellowship in abdominal imaging and intervention at Brigham and Women's Hospital. After completing a clinical fellowship, Dr. Glazer is finishing a research fellowship in image-guided therapy, with a focus on liver and prostate interventions. Dr. Glazer serves on the RSNA Resident and Fellow Committee (RFC) and as chair of the RFC Subcommittee on Communication, which oversees the R³ Program (RSNA Radiology Resident Representative), serving as a bridge between RSNA and residents' respective institutions.

What or who sparked your interest in radiology?

I've had the opportunity to be around radiology my entire life. Both my father and grandfather were radiologists, and I remember being intrigued by their work even as a young child. Because my dad was so passionate about his work, it was clear that being a radiologist was an excellent career choice. I contemplated being a history professor but in the end, I chose radiology because of its integral role in patient care and exciting technology.

What would you describe as the biggest professional challenge you face today?

As someone who is part of an academic department, the biggest challenge for me is balancing the two goals of providing outstanding clinical care, and being as involved in research as possible. Often, the two are complementary, but sometimes academic productivity is slowed because of clinical responsibilities.

What is the biggest reward?

One of the most rewarding aspects of my job is providing the diagnostic information needed to optimize patient care. When a clinical team is struggling, we as radiologists can

often help steer them in the right direction. Being the backbone of medical decision making is truly wonderful!

How does volunteering for RSNA help you in your daily practice?

My involvement with RSNA has helped me collaborate and network with other leaders in the field. It has also helped me to utilize all of the resources RSNA has to offer, such as its well-respected journals and, of course, the annual meeting.

How do you like to spend your free time?

Outside of work, I enjoy spending time with my family (Jane, Jake and Lilah), exploring Boston and the Cape, traveling and running. I am also an avid college football fan. I'm slowly working on getting my wife and kids involved in my sports habit.

Next month's RSNA News features a report on the recent Resident and Fellow Committee meeting at RSNA headquarters in Oak Brook, IL.



Glazer

THIS MONTH IN THE RSNA NEWS ONLINE VERSION

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

This month's stories on breast screening, diffusion-tensor imaging in brain research and the socioeconomic factors that are linked with missed patient appointments feature video interviews with the RSNA 2015 session authors at RSNA.org/News.

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RSNA Board of Directors Report

The RSNA Board of Directors met in January and March to update RSNA's strategic plan, continue planning for RSNA 2016 and approve expanded member opportunities.

Strategic Plan

The Board updated and approved the strategic plan for 2016-2021. The updated plan, which reflects new initiatives and progress on existing ones, can be viewed at RSNA.org/Strategic-Plan.

Digital Roadmap

The Board approved the implementation of a Digital Roadmap to enhance and expand RSNA's digital resources available to members and partners. The plan includes developing a mechanism to track individual professional contributions. A steering committee was established to determine content and oversight, and the full roadmap will be rolled out over several years.

RSNA 2016 Looks Beyond Imaging

RSNA 2016 is taking shape with timely topics. The RSNA/AAPM Symposium will focus on precision imaging in medicine and Special Interest Sessions will cover Image Wisely® and Image Gently®; value over volume in patient care; psychiatric neuroscience; an introduction to QIBA; quality, clinical care and effectiveness in image-guided therapy; and understanding the new American Cancer Society Breast Cancer Screening Guidelines. A number of Controversies and Hot Topics sessions were also approved. Look for more information about RSNA 2016 sessions in upcoming issues of *RSNA News* and at RSNA.org/AnnualMeeting.

Virtual Meeting Expanding

Due to the growing popularity of the Virtual Meeting option for meeting attendees and others, virtual offerings will be expanded to 80 courses during RSNA 2016 and on-demand courses will be available for three weeks following the annual meeting.

Special Interest Group Pilot

In an effort to better serve members' varied interests, RSNA will pilot special interest groups (SIGs). A proposed 3-D Printing SIG will serve as a three-year pilot program to assess the viability of RSNA SIGs and to serve as a model for future programs. Plans and timelines will be developed to launch the 3-D Printing SIG. To establish a SIG, a request from at least 25 current RSNA members will be required.

Derek Harwood-Nash Fellowship Program Expanded

The Board approved increasing the number of Derek Harwood-Nash fellowships from three to four beginning in 2017. The program provides funding for promising international radiology scholars to study at North American institutions for a period of six to 12 weeks. The fellowship honors the memory of former RSNA Board of Directors member Derek C. Harwood-Nash, MD, ChB, DSc, who was a long-time goodwill ambassador for radiology and encouraged worldwide coopera-



Rao

The change also supports RSNA's efforts to make environmentally conscious decisions. More information about how training members can opt-in to the print edition will be shared over the next few months.

MIRC Becomes Open Source

The Board approved the Radiology Informatics Committee's proposal to release the Medical Imaging Resource Center (MIRC) for open-source development and call it the Medical Imaging Resource Community to reflect the change. The MIRC Clinical Trials Processor and Teaching Files System programs will become community-supported open source development projects. RSNA will maintain links to the source code registry, the MIRC documentation wiki and a user discussion group on its MIRC page.

Vijay M. Rao, MD

Chair

RSNA Board of Directors

tion among radiologists.

Established in 1998, the fellowship has been awarded to 36 fellows from 24 nations.

Opt-In for *RSNA News* in Print

Beginning in January 2017, members in training will be asked to notify RSNA if they would like to continue receiving *RSNA News* in print. Results from several surveys of resident and fellow members indicate that a majority of them prefer to read the newsmagazine online.



Researchers: Use Caution with Benefit/Risk Ratios in Breast Screening

BY MIKE BASSETT

Balancing the benefits and risks associated with breast cancer screening continues to be a source of debate throughout the world. In Norway—where a fierce discourse on this issue is underway—researchers are urging the use of caution in interpreting benefit/risk ratios and relaying that information to patients.

Solveig Hofvind, PhD, a researcher in the Department of Screening, Cancer Registry of Norway, spent a year investigating the benefit/detriment ratio estimates of the Norwegian Breast Cancer Screening Program



Hofvind

(NBCSP), which launched as a pilot project in four counties in 1995 and expanded nationally in 2004. Under the government-funded program, all women aged 50 to 69 are invited for mammography screening every two years.

Between 2007 and 2015, the Research Council of Norway evaluated the NBCSP to determine whether the program fulfills its intentions and purpose — a target 30 percent mortality reduction. Using one estimate for reduced breast cancer mortality and one estimate for epidemiologic over-diagnosis, the council determined that the screening initiative reduced mortality by 20 percent to 30 percent for women ages 50 to 69, followed to age 79, when compared with no screening.

For women ages 50 to 79, estimates of over-diagnosis for invasive breast cancer and ductal carcinoma in situ (DCIS) combined ranged from 15 percent to 25 percent, compared with no screening.

Although Dr. Hofvind believed that the council's report had several strengths, she also thought it had several limitations, which spurred her 2015 research project.

“There are huge uncertainties in this evaluation, particularly in the over-diagnosis estimates,” she said.

Quality-Adjusted Life-Years May be a Better Approach

In a study presented at RSNA 2015 and later published in the March 2016 issue of the *Journal of Medical Screening*, Dr. Hofvind and colleagues computed a ratio between the estimated numbers of lives saved from breast cancer death and the number of women diagnosed with breast cancer that never would have been diagnosed during the woman's lifetime had she not attended the NBCSP screening.

Results demonstrated that for every 10,000 women screened biannually, followed until age 79, an estimated 53-61 women were saved from breast cancer death and 45-126 were over-diagnosed. Furthermore, 1,590 women showed false-positive results with a non-invasive assessment, while 410 showed a false-positive result with an invasive procedure.

The risk/benefit ratio using average estimates was 1:1.4, indicating that the program saved about one life per 1-2 women with epidemiologic over-diagnosis, Dr. Hofvind said.

Dr. Hofvind believes she and her colleagues have improved upon models used to determine estimates of breast cancer mortality and over-diagnosis, adding a new perspective to the issue. Nevertheless, she says the range of the estimates vary substantially and should be carefully interpreted before any information is

communicated to women targeted by the screening program.

“Our research demonstrates that it's very difficult to find clear numbers to show the risk/benefit ratio of mammography screening,” Dr. Hofvind said. “The range is so wide and it depends on so many different factors, that it's important to understand the screening logistics and the epidemiology in order to choose the right model to estimate such a ratio.”

Comparing Apples and Oranges

In addition, the ratio includes two events — lives saved from cancer death and cases of over-diagnosis — that are not comparable.

“How can you compare saving a woman from dying of breast cancer to a woman who — because of an over-diagnosis — had to undergo local anesthesia and a small excision for a biopsy? Those events aren't comparable,” Dr. Hofvind said.

In the *Journal of Medical Screening* study, Dr. Hofvind and her colleagues wrote that using a crude risk/benefit ratio may be misleading and that a better approach may be to use quality-adjusted life-years (QALYs) gained from the prevention of breast cancer compared to QALYs lost due to over-diagnosis.

In any event, if a patient asks for information about risk/benefit ratios, that information should be shared and interpreted with substantial care, Dr. Hofvind said. “I know women may ask about this ratio and we have to be prepared to give them information with the best knowledge we have today,” Dr. Hofvind said.

After the Research Council of Norway evaluation was released, the country's health minister confirmed that the NBCSP will continue as usual.

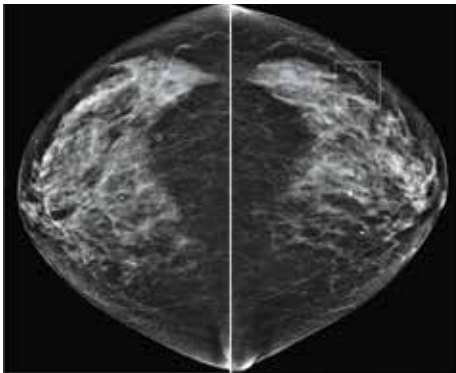
WEB EXTRAS

- ✓ View a video of Solveig Hofvind, PhD, discussing her RSNA 2015 research at RSNA.org/News.
- ✓ Access Dr. Hofvind's research in the March 2016 issue of the *Journal of Medical Screening* at msc.sagepub.com.
- ✓ Access the Research Council of Norway's evaluation of the Norwegian Breast Cancer Screening Program at www.forskningssradet.no.

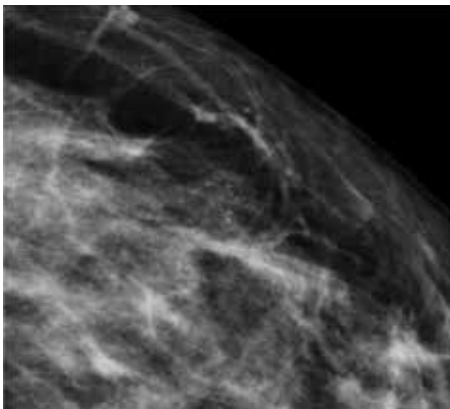
Pre-operative MRI May Play Role in Reducing Recurrence in Triple-negative Breast Cancer

BY MIKE BASSETT

For patients who develop breast cancer, one of the most aggressive subtypes is triple-negative breast cancer, which comprises 15 to 20 percent of all breast cancer, is more likely to spread and has a high rate of recurrence.



A 60-year-old woman, screening mammography. Full-field digital mammography (FDM) cc-views of the right and left breast without zooming appear normal and do not show suspicious lesions. A small cluster of microcalcifications (*quadrant*) is hardly identified on standard images.



Zooming of the lateral part of the left breast shows a small cluster of slightly heterogeneous punctuate microcalcifications. Histology revealed a 3 mm ductal carcinoma in situ (DCIS) Grade 1.

Images courtesy of Woo Kyung Moon, MD.

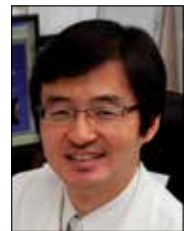
Nevertheless, there is not yet a consensus on the association between the risk of recurrence and imaging factors such as the use of preoperative MRI or mammographic density in patients with triple-negative breast cancer, according to Woo Kyung Moon, MD, Professor of the Department of Radiology, Seoul National University Hospital. In research published in the February 2016 issue of *Radiology*, Dr. Moon and colleagues investigated the effectiveness of preoperative MRI in helping to reduce the risk of recurrence in patients with early stage triple-negative breast cancer, particularly women with dense breasts or a family history of breast cancer.

“It is important to stratify patients based on different features, which potentially enables more personalized screening, treatment and better prediction of outcome,” Dr. Moon said. “If there is an association between the absence of preoperative MRI and recurrence in patients with early stage triple-negative breast cancer, then the use of preoperative imaging may lead to lower recurrence rates in patients with triple-negative breast cancers.”

Triple-negative breast cancer is characterized by lack of estrogen receptor and progesterone receptor expression and absence of human epidermal growth factor receptor 2 (HER2) overexpression.

Dr. Moon and colleagues analyzed 398 patients with early stage (Stage I or II) triple-negative breast cancer, analyzing the patient’s age, symptom status, first-degree family history of breast cancer, presence or absence of preoperative MRI, and mammographic density. The use of preoperative MRI was determined on the basis of the breast surgeon’s recommendation, patient’s preference

or availability of time slots for MRI. Patients demonstrated no significant differences in tumor size, lymph node status, tumor stage or receipt of adjuvant chemotherapy or radiation therapy, Dr. Moon said.



Moon

Results showed that 63 (15.8 percent) of the 398 patients studied showed a recurrent disease after a median follow-up of 6.1 years and that a family history of breast cancer, lymphovascular invasion, and dense breast tissue, were all found to be independently associated with recurrence.

In terms of MRI, researchers determined that patients who did not undergo preoperative MRI were 2.7 times more likely to have a recurrence than those patients who underwent preoperative MRI.

“Our study suggests that the use of preoperative MRI may help reduce the risk of recurrence in patients with early stage triple-negative breast cancer, particularly in women with dense breasts or a family history of breast cancer,” Dr. Moon said.

Results also demonstrated that mammographic density was an independent risk factor for recurrence in patients with triple-negative breast cancer.

“For women younger than 55, there was a stronger association of mammographic density with estrogen receptor–negative cancers compared with estrogen receptor–positive cancers, which suggests that high mammographic density may play an important role in tumor aggressiveness, especially in younger women,” Dr. Moon added.

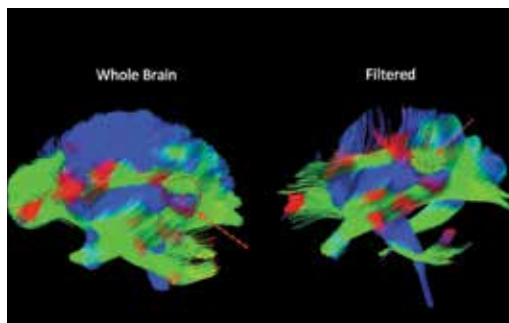
WEB EXTRAS

Access the study, “Early Stage Triple-Negative Breast Cancer: Imaging and Clinical-Pathologic Factors Associated with Recurrence,” by Dr. Moon and colleagues in the February 2016 issue of *Radiology* at RSNA.org/Radiology.

The Promise and Potential of DTI in Neurology

BY PAUL LATOUR

New research continues to advance the powerful potential of diffusion-tensor imaging (DTI) in brain research and brain mapping, ensuring the technology's place on the path to precision medicine.



DTI creates a color-coded image of the brain that establishes functional network resection boundaries around the tumor. Fiber tracking can provide better 3-D understanding of tumor borders (red arrows) on eloquent white matter bundles. Image courtesy of John L. Ulmer, MD.

“These results suggest that individualized quantitative analysis of DTI in the setting of mild traumatic brain injury (MTBI) might ultimately aid in MTBI prognostication.”

MICHAEL L. LIPTON, MD, PHD

“The role of neuroimaging in determining prognosis in concussion patients remains an area of huge interest and growth,” said Michael L. Lipton, MD, PhD, associate director of the Gruss Magnetic Resonance Research Center and director of radiology research and MRI at Albert Einstein College of Medicine and Montefiore Medical Center in the Bronx, New York.

“Our approach to individualized analysis of DTI and its enhancement of outcome prediction should be seen as a significant step toward realization of precision imaging (that is, precision medicine application of quantitative radiology methods to make patient-centered diagnostic inferences),” Dr. Lipton added.

Unlike standard imaging techniques, DTI can uncover the underlying pathology for traumatic brain injury (TBI) and mild traumatic brain injury (MTBI). Between 15 percent and 30 percent of people suffering MTBI - or concussion - will have continued problems resulting from such an injury, a group often referred to as the “miserable minority,” Dr. Lipton said.

“The biggest conundrum in TBI research and clinical care is who is going to recover and who is part of that miserable minority,” Dr. Lipton said. “We’d like to know who they are up front rather than waiting it out for the effects to present.”

DTI Could Aid Mild Traumatic Brain Injury Prognosis

Two recent studies presented by Dr. Lipton and colleagues at RSNA 2015 show the potential role DTI could play in helping people most at risk for persistent, long-term problems that result from head injuries.

DTI abnormalities around the time of injury are significantly related to long-term outcomes, said Sara B. Rosenbaum, MD, a second-year radiology resident at Albert Einstein College of Medicine and Montefiore Medical Center who presented one of the studies at RSNA 2015.

“Prospective identification of those at risk may allow for improved patient management and inform treatment trials,” Dr. Rosenbaum said.

The researchers recruited 31 MTBI patients from a local emergency center as well as 40 healthy volunteers. DTI at 3 Tesla (3T) was performed within two weeks of injury and cognition was tested at one year post-injury.

Subjects were classified based on the presence or absence of abnormally high radial diffusivity (RD) within two weeks of injury in brain regions commonly affected by TBI (left frontal, right frontal, left temporal, right temporal and corpus callosum). T-tests compared cognitive outcomes between subjects with or without abnormally high RD in each region.



Lipton



Rosenbaum

The results showed subjects with abnormally high RD in the left temporal and right temporal lobes performed worse on cognitive tasks at one year post-injury.

"These results suggest that individualized quantitative analysis of DTI in the setting of MTBI might ultimately aid in MTBI prognostication," Dr. Lipton said. "DTI could thus, if further study confirms its prognostic value, be used as a noninvasive biomarker in the acute setting to identify those who will have poor long-term outcome."

Sex Plays Role in Negative Long-Term Effects of Sports-Related Head Injury

In a related study done at Einstein, researchers used DTI to determine that sex is a potential risk modifier for the negative long-term effects of head injury, specifically that women have a higher risk than men.

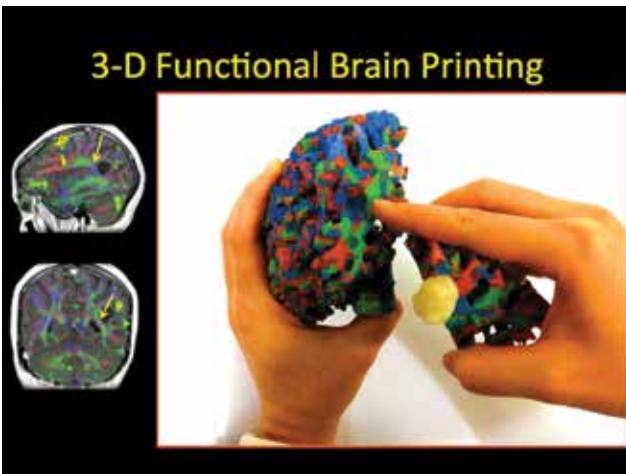
The researchers studied 41 females and 41 age- and education-matched males (ages 18-52) drawn from an ongoing longitudinal study of repetitive head impacts on amateur soccer players. The research included a questionnaire to help estimate the number of headers performed over the prior 12 months.

Analysis following 3T DTI imaging and neurocognitive testing revealed that women appear to have a greater response to repetitive head impacts for the same amount of heading. The researchers found more evidence of white matter microstructural damage and worse cognitive performance in women compared to men.

"The overall goal is to generate guidelines for safe heading exposure," said Eva Catenaccio, MD, of Einstein, who presented the research. "These results demonstrate that these guidelines need to be sex-specific."

DTI Plays Role in Brain Mapping

DTI also plays an essential role in preoperative brain mapping, which is creating a major shift in the neurosurgical care of brain tumor patients.



The next step in preoperative neurosurgery is adapting 3-D functional brain printing (above), which can provide a 3-D perspective of critical functional network, an educational tool during consultation with brain tumor patients, and a take-home, customized model for greater understanding. Yellow arrows indicate critical language and vision networks adjacent to the tumor (beige object). 3-D functional brain print provided by Joshua Pohlman, MD, a second-year resident at the Medical College of Wisconsin.

The mapping depicts individual white matter tracts, which aid surgeons in safely resecting and removing brain tumors, according to John. L. Ulmer, MD, chief of neuroradiology and director of neuroradiology research at the Medical College of Wisconsin in Milwaukee.

"Using standard imaging alone is insufficient in determining the relationship of the brain tumor to any of the given white matter networks around it," Dr. Ulmer said.

Because white matter is difficult to identify anatomically during surgery, Dr. Ulmer said surgeons often cannot tell which white matter tract controls critical functional areas such as motor skills, language, vision and memory. DTI creates a color-coded image of the brain that establishes functional network resection boundaries around the tumor.

"Preoperative DTI helps the surgeon avoid injuring eloquent brain networks when taking tumors out. By doing that, we're showing we can improve function and reduce post-operative deficits," he said.

In research presented at RSNA 2015, Dr. Ulmer demonstrated that preoperative DTI leads to improved neurological outcomes. In one retrospective study, he measured outcomes in 33 left (dominant) posterior frontal lobe resected tumors. In 18 patients without DTI, seven (39 percent) experienced permanent neurologic deficits. Of the 15 patients where DTI was utilized, only one (7 percent) experienced permanent neurologic deficits.

In collaboration with the Department of Neurosurgery, a separate and ongoing retrospective pilot study also found improved postoperative neurological outcomes with preoperative mapping. There was no difference in the 30-month survival rates between groups with or without preoperative DTI and functional MRI (fMRI). The same study showed a non-significant trend in improved survival in the pre-mapped group during the first 15 months after surgery.

Dr. Ulmer said a next step in preoperative neurosurgery is adapting 3-D functional brain printing. This would provide neurosurgeons with a 3-D perspective of the critical functional white matter network relationships as well as an educational tool during consultations with brain tumor patients. The model would also provide patients with a take-home, customized model for greater understanding and consultation with family and loved ones.



Catenaccio



Ulmer

WEB EXTRAS

View a video of Michael L. Lipton, MD, PhD, and Eva Catenaccio, MD, discussing their RSNA 2015 research, "Diffusion Tensor MRI Reveals Gender-Based Risk for Traumatic Brain Injury in Soccer Players," at [RSNA.org/News](https://www.rsna.org/News).

View a video of Dr. Lipton and Sara B. Rosenbaum, MD, discussing their RSNA 2015 research, "Abnormal Radial Diffusivity Predicts Worse Cognitive Function One Year Following Concussion (Mild Traumatic Brain Injury)," at [RSNA.org/News](https://www.rsna.org/News).

Socioeconomic Disparities May Foster “Missed Care Opportunities”

BY MIKE BASSETT

After missing two scheduled MRI appointments at Massachusetts General Hospital (MGH), a patient of Efren J. Flores, MD, finally made it to MGH on her third attempt.

When Dr. Flores, a diagnostic radiologist at MGH, investigated, he found that the patient missed her first two appointments for a very simple reason — phone message reminders left by the hospital were in English, which is not the patient’s primary language.

This led Dr. Flores to wonder how many other patients were in similar situations and weren’t receiving proper health care on a timely basis “because they are falling through the cracks and can’t navigate the healthcare system.”

The incident created an opportunity for radiologists at MGH as well, Dr. Flores said.

With the help of his colleagues, Dr. Flores launched a study to determine whether socioeconomic disparities have an impact on access to radiology and imaging services. In the course of his research — which was presented at RSNA 2015 — Dr. Flores used a different term to describe the event that is typically referred to as a patient “no-show.”

“Missed Care Opportunity — or MCO — is a better term,” he said. “It reflects what should be the shared responsibility of providers to engage patients in their health care, rather than blaming the patient and labeling them as ‘no-shows.’”

While there is no shortage of research analyzing socioeconomic disparities in healthcare in general, very little research focuses on how those disparities pertain specifically to radiology, Dr. Flores said.

James Brink, MD, radiologist-in-chief at MGH and the Juan M. Taveras Professor of Radiology at Harvard Medical School, suggested that radiology’s role out of the primary care spotlight could be a factor.

“It could be that radiology isn’t considered to be ‘frontline’ medicine,” Dr. Brink suggested. “It’s considered more consultative medicine rather than primary care, and the battleground for serving underserved areas and ensuring access for underserved communities has been more about primary care.”

Research Spotlights Patient Access to Imaging

Nevertheless, some studies have addressed this issue as it pertains to radiology and medical imaging—not always drawing the same conclusion.

For example, in a study published last year in *PeerJ*, Afton McNierney-Moore, DO, an emergency medicine phy-



Flores



Brink

5 Tips to Prevent Missed Care Opportunities (MCOs)

1. Offer reminder text messages or phone calls in the patient’s preferred language
2. Provide procedure preparation instructions and clearer educational materials in various languages
3. Allocate advocates who can assist patients with items like healthcare system navigation and transportation to appointments
4. Closely collaborate with referring physicians to develop effective solutions based on patient’s needs
5. Provide greater education to professionals and institutional leaders on the importance of culturally sensitive healthcare delivery

— Efren J. Flores, MD

sician at the Texas A&M School of Medicine in Corpus Christi, and colleagues examined whether cultural differences and language barriers would adversely affect a patient’s understanding of the risks associated with medical imaging. Examining a study group that included Hispanic and non-Hispanic patients, researchers determined that while the group’s overall knowledge of radiation risk was poor, there was no significant difference between Hispanic and non-Hispanic patients in terms of understanding radiation risk.

A study in the September/October 2015 issue of the *Journal of Public Health Management & Practice* determined that Hispanic women have lower odds of undergoing mammograms than non-Hispanic white women. Study author Smruti Jadav, MPharm, MS, and colleagues from the University of Texas Medical Center in Houston, concluded that better access to care, education and income, along with improved insurance access would considerably increase breast screening rates among Hispanic women.

In his research, Dr. Flores and colleagues collected data on almost 1 million radiologic examinations at MGH ordered during 2014. Researchers determined that an MCO was the most common reason that patients failed to complete a radiologic examination. Overall, about 5 percent of radiology appointments in 2014 resulted in an MCO.

“We found that healthcare disparities exist in radiology,” Dr. Flores said. Specifically, lower incomes, a primary language other than English, and African-American or Hispanic ethnicity were

WEB EXTRAS

View a video of Efren J. Flores, MD, and Omid Khalilzadeh, MD, MPH, discussing their RSNA 2015 research at RSNA.org/News.

“Each imaging exam is a patient encounter, so we really see more patients than any other specialty. We need to step out of our reading rooms and see what our patients really need.”

EFREN J. FLORES, MD

significantly associated with greater odds of an MCO for a radiology appointment.

“So the first step was to find out if there was a problem and the answer to that was ‘yes,’” Dr. Flores said. “And since there is a problem, there are also opportunities to make it better—to show that radiology cares.”

One of the next steps Dr. Flores took—with the help of medical analytics groups at MGH—was to develop an algorithm or mathematical predictive model based on big data predictive analytics. The goal is to identify patients at risk for MCOs in order to develop interventions that successfully mitigate those missed chances.

While the nature of those interventions has yet to be determined, Dr. Brink said the radiology department at MGH is making this issue a priority.

“We have a strategic planning retreat every year and one of the goals for this year is to respond to the conclusions detailed in Efren’s study,” Dr. Brink said. “One thing we have done recently

is to partner with our MGH Center for Community Health Improvement (CCHI), which focuses many activities in areas that Efren has shown are most in need of our help.”

“We’re starting to meet with CCHI to see what kinds of opportunities there are based on our research and how we can collaborate and come up with some solutions,” said Dr. Flores, who serves as the radiology department’s liaison to the CCHI.

“Each imaging exam is a patient encounter, so we really see more patients than any other specialty,” Dr. Flores said. “We need to step out of our reading rooms and see what our patients really need. There are going to be certain things that are beyond our control, but we can do the little things, whether it’s making sure patients get the appropriate prep before a CT or MRI, or helping them coordinate transportation so they get to their appointment on time and home safely.

“These steps add up to doing a better job in providing care,” he said.

RadiologyInfo.org Offers Patient Information in Spanish



Important patient information is offered in English and Spanish on the RSNA/ACR website, *RadiologyInfo.org* featuring detailed, easy-to-understand descriptions of more than 200 radiologic tests and treatments, disease/condition descriptions and screening/wellness topics. The website’s “Your Radiologist Explains” series featuring 81 videos of radiologists explaining common imaging tests in easy-to-understand language, offers four videos in Spanish (Angioplasty and Vascular Stenting, Vascular Access Procedures, Head CT and Contrast Materials), with more in development.

Unique Stressors Lead to Burnout in Radiology

BY MARY HENDERSON

Take a look around your workplace. If your fellow radiologists are anything like the thousands of physicians recently surveyed by Medscape, half of your colleagues could be experiencing burnout.

In fact, one of every two radiologists surveyed in the *Medscape Lifestyle Report 2016: Bias and Burnout*, said they felt the classic symptoms of burnout defined by the report as a loss of enthusiasm for work, cynicism and a low sense of personal accomplishment. In terms of the highest burnout rates, radiologists ranked tenth among the 26 medical specialties surveyed by *Medscape*, a Web resource for physicians and health professionals. Of the 15,800 physicians polled, front-line practitioners in critical care, urology and emergency medicine took the top three spots, all registering 55 percent burnout.

The top three causes of burnout physician-wide were having too many bureaucratic tasks, too many work hours and increasing computerization. For radiologists, income issues and the reimbursement imbalance that has emerged in recent years are often central to stress and burnout, said Peter S. Moskowitz, MD, clinical professor emeritus of diagnostic radiology at Stanford University School of Medicine, and a nationally recognized physician career counselor.

“Since 2000, imaging utilization has increased without proportionate increases in reimbursement, which has created an increasing gap between productivity and

reimbursement,” Dr. Moskowitz said. “Additionally, a relentless emphasis on radiologists’ production at the expense of workstyle has occurred. “That’s a set-up for stress and burnout,” Dr. Moskowitz said. “Making things worse, physicians often have poor stress-coping skills.”

As a former practicing radiologist and the founder and executive director of the Center for Professional & Personal Renewal, Dr. Moskowitz knows firsthand the tremendous pressures radiologists face each day. After experiencing his own career burnout in the early ‘90s, he completed a two-year training course in professional and organizational coaching and became one of the first physicians in the U.S. to become certified in career and life coaching.

“In the process of my own healing, I began to appreciate how common burnout is among the physicians around me,” he said. “I believed I could play an important role in helping physicians recover from burnout.”

Since 1998, when he reduced his radiol-



Moskowitz

ogy practice to half-time to accommodate his coaching career, he has provided one-on-one coaching to more than 400 physicians — including a growing number of radiologists over the last four years.

“To sustain income and lifestyle, radiology practices must focus on productivity, which is a major stressor on radiologists that manifests in various forms,” he said.

In an opinion piece in the July 2015 issue of *Radiology*, Dr. Moskowitz urged radiology leaders and practitioners to take better care of themselves and each other. In addition to a national symposium devoted to improving radiologists’ wellness, Dr. Moskowitz recommended mental health and career planning resources for radiologists, research grants to evaluate evidence-based interventions and the addition of wellness-based curriculum components for trainees.

Holistic Approach Could Benefit Radiology Trainees

Because trainees are the future of the specialty, the potential causes of stress and burnout need to be addressed — and prevented — early-on, experts say.

In a 2013 study of 266 radiology trainees published in *Academic Radiology*,





McNeeley

Michael F. McNeeley, MD, assistant professor of body imaging at the University of Washington (UW), and colleagues determined that the majority of trainees experienced routine symptoms of emotional exhaustion and depersonalization — often

accompanied by issues of financial scarcity.

“The crux of our research was that many medical students choose radiology with a certain set of expectations and yet the conditions of the field have changed,” said Dr. McNeeley, who works closely with UW’s Radiology ResideA significant percentage of young children who have radiographic findings of abuse in the body will also have evidence of traumatic injury to the heady Program. “That disconnect — along with the inherent stresses of becoming a physician — causes burnout.”

He believes residency program leaders can help improve the experience for trainees by taking a holistic approach to wellness and incorporating debt and financial counseling into training programs.

“It doesn’t take a lot of resources to make a huge difference in resident wellness,” said Dr. McNeeley. “We need to make sure residents have a sense of purpose and feel like important and valued members of the department.”

For practicing radiologists, Dr. Moskowitz said the first step is to simply begin a dialogue with one another.

“Once people start talking, solutions can be found,” he said. “Radiology practices and departments need to establish the values that are important to them, get clear about what is missing and then stand together to make it happen.”

In his workshops and lectures, he suggests various ways practice leaders can improve daily work life, from mentoring younger

physicians and making reading room environments healthier to providing flexible work options and recognizing peer performance.

Work-Life Balance Critical

Regardless of career stage, the absence of work-life balance is the single most important contributor to physician burnout, Dr. Moskowitz said.

“Once we begin working through tough questions, options always emerge,” he said. “Whether it’s working less, shifting to a different type of work, spending less time engaged in stress-inducing activities or having more fun outside of work.”

With a better attitude and work-life balance, Dr. Moskowitz said his clients’ views of their practices often change.

“I’ve worked with physicians who thought their only option was to leave medicine, and were ultimately glad they stayed,” he said.

No matter what approach radiologists embrace, Drs. Moskowitz and McNeeley believe that the time is now to deal with the unique stressors of radiology and the changing healthcare environment.

“It’s an existential imperative for radiologists to see to the wellness of practicing radiologists and radiologists in training,” Dr. McNeeley said.

“It doesn't take a lot of resources to make a huge difference in resident wellness. We need to make sure residents have a sense of purpose and feel like important and valued members of the department.”

MICHAEL F. MCNEELEY, MD

WEB EXTRAS

☑ Access the July 2015 *Radiology* article by Peter Moskowitz, MD, “Gathering Storm Clouds Suggest the Need for a Culture Change in Radiology: Radiologist-centered Imaging,” at RSNA.org/Radiology.

☑ Access the article, “The Emotional Wellness of Radiology Trainees,” by Michael F. McNeeley, MD, and colleagues, at AcademicRadiology.org.

ANCE



Radiology Plays Critical Role in the Diagnosis of Child Abuse

BY RICHARD DARGAN

Radiologists are often the first clinicians to see evidence of physical child abuse—such as a broken rib at the edge of an abdominal radiograph or a healing fracture near the site of a new fracture. Detection of these cases and appropriate communication can help prevent future patient injury, mistreatment or even death.

New research and continuing education are moving radiology and all of healthcare toward important advances in diagnosing child abuse and neglect that continues to occur at a staggering rate. According to 2014 Child Maltreatment Report from the U.S. Department of Health and Human Services, an estimated 1,580 children died from abuse and neglect and three-quarters (70.7 percent) of all child fatalities that year were younger than 3 years old.

“Diagnosing a child abuse case can be a very complex and difficult process,” said researcher Sarah Sarvis Milla, MD, FAAP, associate professor of radiology and imaging sciences at Emory University School of Medicine, Atlanta. “Fortunately, radiologists are not working in a vacuum, but as part of a team of doctors, nurses, social workers and law enforcement officers who want the best outcome for the child.”

This collaborative approach was the focus of the three-day course in February, “2016 Imaging of Child Abuse: Exam Room, Reading Room and Court Room,” co-sponsored by the Society for Pediatric Radiology (SPR) and the American Academy of Pediatrics (AAP). Dr. Milla is on the Executive Committee of the AAP Section on Radiology (AAP SoRa) and served on the planning committee for the course, which covered neurological, skeletal and visceral injury patterns seen with child abuse, among many other topics.

Course presenters stressed that the rate of physical abuse is highest among infants (<1 year) and young children and fractures are the second most common injury after bruises in this age group. Almost a quarter of fractures in infants are attributable to physical abuse.

“Posteromedial rib fractures are particularly concerning because they suggest that the child has been squeezed, causing the ribs to bend over the spinous process of the vertebral body,” said Sabah Servaes,



ON THE COVER: A 3-D reconstruction of a child with multiple rib fractures. Although the axial source images demonstrate the fractures well, 3-D reconstructions are helpful for referring healthcare providers and others less familiar with radiology.

Image courtesy of Sabah Servaes, MD.

MD, a pediatric radiologist from the Children’s Hospital of Philadelphia, chair of SPR’s Child Abuse Imaging Committee and course director of the recent SPR-AAP program. As children get older, abuse-related injury patterns change. Older children tend to experience more visceral injuries, from being punched and kicked. Fractures of different ages may be apparent on imaging. Radiologic findings in children are particularly concerning when the incident reported by the parent or caregiver does not match up with the injuries evident on imaging.

“If a 3-month-old baby is brought in because she isn’t moving her arm and the radiograph shows a fracture, without a history of trauma, this would be a concerning injury,” Dr. Milla said. “Other times, we may incidentally detect prior trauma. For instance, a chest radiograph of a baby with a cough and fever showing healing posterior rib fractures.”

The first and most important thing radiologists must do in the event of a suspicious finding is discuss it with the referring physician, Dr. Servaes said.

“Communication is imperative,” she said. “In some cases, the radiologist may not have received the entire history and there may be an underlying metabolic disorder that would explain the injury.”

If abuse is suspected, additional imaging is likely to begin with a skeletal survey, a series of about 20 X-rays of the child’s entire body.

“On a skeletal series, you might see older fractures in different states of healing, which suggests the child has experienced multiple episodes of trauma,” Dr. Milla said.

Radiologists also play a critical role in ruling out mistreatment and abuse, she said. “In cases when we find no radiologic evidence of abusive injury, that can be helpful to the clinician to support a decision that a child is *not* being abused.”

WEB EXTRAS

- Access the *Radiology* study, “Absence of Rickets in Infants with Fatal Abusive Head Trauma and Classic Metaphyseal Lesions,” at RSNA.org/Radiology.
- Access the ACR Appropriateness Criteria for suspected physical abuse of a child at ACR.org.
- The Society for Pediatric Radiology offers reference articles on child abuse at pedrad.org/Specialties/Child-Abuse-Imaging.

Radiology Central to Timeline of Events in Detecting Child Abuse

The role of radiology in identifying signs of child abuse began in 1946 when pediatric radiologist John Caffey, MD, theorized that infants and young children with the simultaneous noted fractures of the extremities and subdural hematoma were likely the victims of physical abuse.

1946

Dr. Caffey describes six infants with long bone fractures and subdural hematomas and postulates that these injuries were inflicted.

1957

Dr. Caffey describes the classic metaphyseal fracture, which—along with posterior rib fractures—is the most common high-specificity injury in child abuse.

1962

Pediatrician C. Henry Kempe, MD, and colleagues coin the term “battered child syndrome” to describe metaphyseal fracture and other injuries typical of abuse.

1971

Pediatric neurosurgeon Norman Guthkelch, MD, publishes a paper theorizing that a child could be shaken violently and develop bleeding on the brain without any broken bones, bruises or other signs of physical abuse.

1998

Radiologist Paul Kleinman, MD, publishes a system of fracture classification, including categories for high, moderate and low specificity for the ultimate diagnosis of child abuse.

2009

ACR publishes a set of appropriateness criteria for imaging cases of potential child abuse.

Research on Rickets Moves Discussion Forward

Along with searching for fractures and other injuries, radiologists are also examining children for alternative diagnoses or underlying disorders or syndromes such as rickets and metaphyseal dysplasia. In fact, differentiation of abuse-related fractures from fractures caused by underlying medical conditions has been a controversial issue in radiology, particularly with respect to rickets, a disease in which a child’s bones soften and weaken, usually due to a vitamin D deficiency. When abuse cases go to court, defense lawyers often raise the specter of rickets as a potential source of fractures, Dr. Milla said.

“There are people in the minority of the radiology community who believe we are misdiagnosing child abuse,” Dr. Milla said. “However, the dominant view among pediatric radiologists is that if there is no radiographic evidence of rickets, it’s unlikely that fractures would be due to undiagnosed rickets.”

A 2015 *Radiology* study demonstrated that certain types of fractures in young children are more likely to be associated with child abuse than rickets. In the study also presented at RSNA 2015, researchers analyzed nine cases of infant homicide that had been referred from the state medical examiner’s office for the evaluation of possible child abuse. The victims had classic metaphyseal lesions (CMLs), also known as “corner” or “bucket handle” fractures. CMLs are considered highly specific for child abuse in infants. The researchers’ analysis of radiographic and histologic findings revealed no features of rickets among the victims, no support for the view that the CML is due to rickets.

“If you see CMLs, you should be especially concerned about child abuse,” said the *Radiology* study’s lead author Jeannette M. Pérez-Rosselló, MD, an assistant professor of radiology at Harvard Medical School, Boston Children’s Hospital, who was also a presenter at the 2016 AAP seminar. “With rickets, there are labs and other imaging findings that contribute to making the diagnosis.”

A major review published in 2016 in *Pediatric Radiology* echoed that viewpoint. Researchers synthesized relevant scientific data distinguishing clinical, radiologic and laboratory findings of metabolic disease from findings in abusive injury and concluded that fractures with high specificity for child abuse like CMLs are not a consequence of rickets.

“The main focus of the review is to provide the scientifically established basis for the causes of fractures in young children,” Dr. Servaes said.

The Evolving Role of Radiology in Detecting Child Abuse

Since pediatric radiologist John Caffey, MD, first identified radiologic signs of child abuse in 1946 (See sidebar), the role of diagnostic imaging in detecting child abuse has grown considerably.

Along with research and education, improvements in existing technology and the development of CT and MRI have helped refine radiologists’ understanding of injuries related to child abuse.

In 2009, the American College of Radiology (ACR) published a set of appropriateness criteria for imaging cases of potential child abuse, although specific protocols may vary among institutions. A head CT is commonly ordered for children suspected of being victims of abuse. CT scans can



Milla



Servaes



Pérez Rosselló

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 Kalyani Vallurupalli, MD &
 Srikanth Vallurupalli
 Ester P. Van der Wal, MD &
 Djavid Hadian, MD
 Joshua A. Walsh, MD
 Phillip G. Wortley, MD

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Radiology Plays Critical Role in the Diagnosis of Child Abuse

Continued from Page 14

show skull fractures, identify brain injury and detect bleeding in and/or around the brain.

“Following the ACR appropriateness criteria, a head CT is usually appropriate in a child less than 2 years old with signs of abuse,” Dr. Milla said. “A significant percentage of young children who have radiographic findings of abuse in the body will also have evidence of traumatic injury to the head.”

At many hospitals, brain MRI is performed in the event of a positive head CT finding to help discern the extent of injuries as well as detect more subtle injuries. Some facilities also opt for a cervical spine MRI to look for damage to neck ligaments and other evidence of spinal trauma.

Bone scans with technetium-99 are being used at some medical centers if the skeletal survey is negative but the suspicion of abuse is high. Some medical centers are using PET in child abuse cases as it has demonstrated better specificity. Research has shown that whole body PET has better sensitivity than a skeletal survey in the detection of some fractures related to child abuse, but lower sensitivity in the detection of CMLs.

Abuse cases often end up going to trial, and the radiologist involved in the case may be asked to testify.

“The courtroom is out of a radiologist’s element,” Dr. Servaes noted. “If you do testify, it’s important to be able to express things in a way that people outside of medical professions can understand.”



Image courtesy of the American Academy of Pediatrics.

Radiology in Public Focus

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

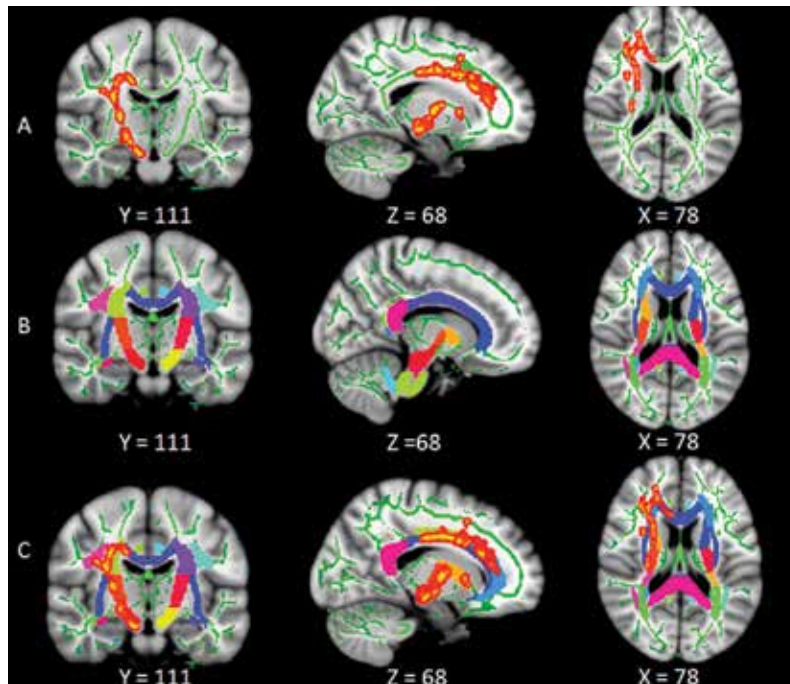
Reduced Integrity of Right Lateralized White Matter in Patients with Primary Insomnia: A Diffusion-tensor Imaging Study

White matter (WM) tracts related to regulation of sleep and wakefulness, and limbic cognitive and sensorimotor regions, are disrupted in the right brain in patients with primary insomnia. The reduced integrity of these WM tracts may be because of loss of myelination, new research shows.

Shumei Li, MS, of Guangdong No. 2 Provincial People's Hospital in Guangzhou, China, and colleagues compared changes in diffusion parameters of WM tracts from 23 primary insomnia patients and 30 healthy control (HC) participants, and evaluated the accuracy of these changes in distinguishing insomnia patients from HC participants.

Primary insomnia patients had lower fractional anisotropy (FA) values mainly in the right anterior limb of the internal capsule, right posterior limb of the internal capsule, right anterior corona radiata, right superior corona radiata, right superior longitudinal fasciculus, body of the corpus callosum, and right thalamus.

"Our study suggests that primary insomnia is characterized by altered structural connectivity related to regulation of sleep and wakefulness, particularly involving limbic cognitive function and sensorimotor regions," the authors write.



Tract-based analysis for whole white matter (WM) tracts. A: Significant differences in WM detected from analysis of tract-based spatial statistics. Results are shown overlaid on the Montreal Neurologic Institute 152-T1 template and the mean fractional anisotropy (FA) skeleton (green). B: The Johns Hopkins University International Consortium of Brain Mapping Diffusion Tensor Imaging 81 Atlas that covers the entire skeletons of major WM tracts is shown overlaid on the Montreal Neurologic Institute 152-T1 template. C: The overlaid region of significant clusters obtained from tract-based spatial statistics analysis and the Johns Hopkins University International Consortium of Brain Mapping Diffusion Tensor Imaging 81 Atlas. The overlapping WM labeling from the Johns Hopkins University International Consortium of Brain Mapping Diffusion Tensor Imaging 81 atlas was used to extract the whole WM and to calculate the mean FA value that represents the integrity of the whole tract.

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June Public Information Outreach Puts Focus on Men's Health

In recognition of Men's Health Awareness Month in June, RSNA is distributing public service announcements (PSAs) focusing on Abdominal Aortic Aneurysm (AAA), a leading cause of sudden death for men over age 60.

The RSNA "60-Second Checkup" audio program also will be distributed to nearly 65 radio stations across the U.S. and will focus on ultrasound- and MRI-guided prostate biopsy.

NEW: "Your Radiologist Explains" Video

Visit RadiologyInfo.org, the public information website produced by RSNA and ACR, to view the newest "Your Radiologist Explains" video on Pediatric Computed Tomography (CT).

RadiologyInfo.org
For patients

Combat-related Mild Traumatic Brain Injury: Association between Baseline Diffusion-tensor Imaging Findings and Long-term Outcomes

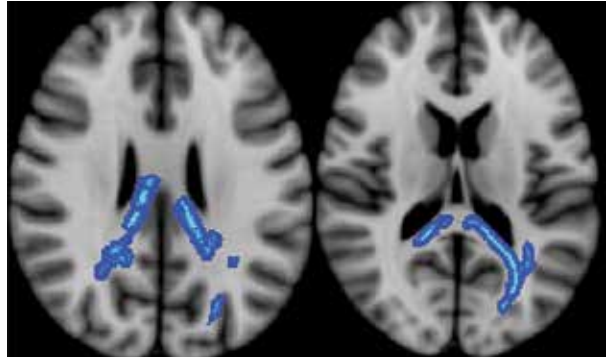
Differences in white matter microstructure may partially account for the variance in functional outcomes among veterans who sustained combat-related mild traumatic brain injury (MTBI), according to new research.

Jeffrey B. Ware, MD, of the Philadelphia VA Medical Center, and colleagues studied 57 male combat veterans with MTBI who had undergone brain MRI between Jan. 1, 2008 and Sept. 30, 2013.

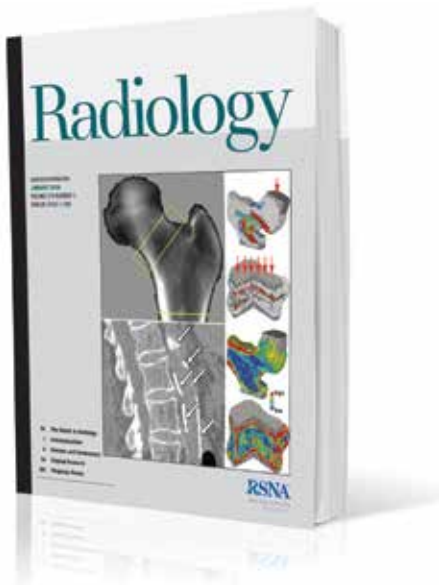
Overall, veterans had a mean of 46 health care visits per year during the follow-up period. Cumulative health care visits over time were inversely correlated with diffusion anisotropy of the splenium of the corpus callosum and adjacent parietal white matter. Clinical measures obtained during initial postdeployment evaluation were not predictive of later functional status.

“Our results suggest that diffusion measurements hold the potential to confer important prognostic information in the clinical evaluation of combat-related MTBI. These findings should encourage continued research efforts to further refine and investigate the clinical utility of diffusion measurements in this setting,” the authors write.

Radiology



Results of voxel-wise correlation of fractional anisotropy fiber integral (FAFI) with the number of healthcare visits over time across all subjects, controlled for effects of age, education level, time from injury, comorbid diagnoses and occupational status. Results are overlaid on axial structural images of template brain and show regions of inverse correlation (P = .026–.05) within white matter of splenium of corpus callosum, left and right parietal lobes, and left temporal lobe (regions where lower FAFI is found among those with more health care visits over time). Colored voxels = significant voxels after correction (dark blue, P < .05; light blue, P < .04). (Radiology 2016;27;InPress) ©RSNA 2016. All rights reserved. Reprinted with permission.



Media Coverage of RSNA

In February, 1,987 RSNA-related news stories were tracked in the media. These stories reached an estimated 1 billion people.

Coverage included United Press International, Yahoo! Finance, Bloomberg News, Business Wire, CBSNews.com, ABCNews.com, About.com, Medical News Today, Radiology Today, Applied Radiology, Auntminnie.com, Health Imaging & IT and DOTmed Healthcare Business News.

For Your Calendar

JULY 31 – AUG. 3
Association for Medical Imaging Management (AHRA)
 Nashville, Tennessee
[Visit the RSNA Booth](#)
 • [AHRAonline.org](#)

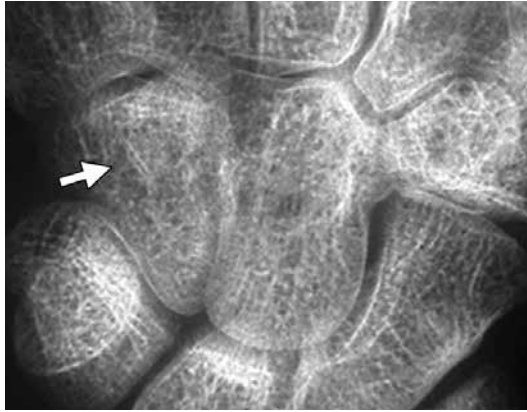
AUG. 19-21
Asian Oceanian Society of Radiology (AOSR)
 Beijing, China
[Visit the RSNA Booth](#)
 • [TheAOSR.org](#)

SEPT. 8-10
Interamerican College of Radiology (CIR)
 Lima, Peru
[Visit the RSNA Booth](#)
 • [WebCIR.org](#)

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

Journal Highlights

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



Posteroanterior radiograph in a 43-year-old male golfer with wrist pain after mis-hitting the ball and striking the ground with the club face. A hook hamate fracture is suspected due to the absence of visibility of the hook (arrow).

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

Imaging of Sports-related Hand and Wrist Injuries

Imaging plays an essential role in the optimal depiction and assessment of the extent of injury, enabling choice of the most appropriate therapeutic approach for sports-related hand and wrist injuries, which can be divided into two categories: traumatic injuries and overuse injuries.

Radiology

In an article in the June issue of *Radiology* (RSNA.org/Radiology) that is part of the ongoing Sports Imaging series, Eric Cockenpot, MD, of CHRU Lille Centre de Consultations et d'Imagerie de l'Appareil Locomoteur in Lille, France, and colleagues review the most common hand and wrist sports-related lesions.

Acute wrist injuries are predominantly bone fractures, such as those of the scaphoid, hamate hook and ulnar styloid. Ligaments lesions are more challenging for radiologists and may lead to carpal instability if undiagnosed. Overuse wrist injuries are mainly represented by tendinous disorders, with De Quervain syndrome and extensor carpi ulnaris tendon disorders the most common among them; however, there are other possible disorders such as impaction syndromes, stress fractures and neurovascular lesions. Finally, finger lesions, including closed tendon injuries (mallet and boutonniere injuries, jersey finger and boxer's knuckle), flexor pulley injuries, and skier's thumb, should also be detected.

"Hand and wrist sports-related injuries are common and typically related to specific movements and stresses. When overlooked, their functional consequences can be harmful," the authors write.

Finding the Nidus: Detection and Workup of Non-CNS Arteriovenous Malformations

Vascular anomalies represent multiple pathologically distinct entities with vastly different clinical manifestations, natural histories and treatments. Compared with other vascular malformations, arteriovenous malformations (AVMs) are considered the most symptomatic and difficult to manage.

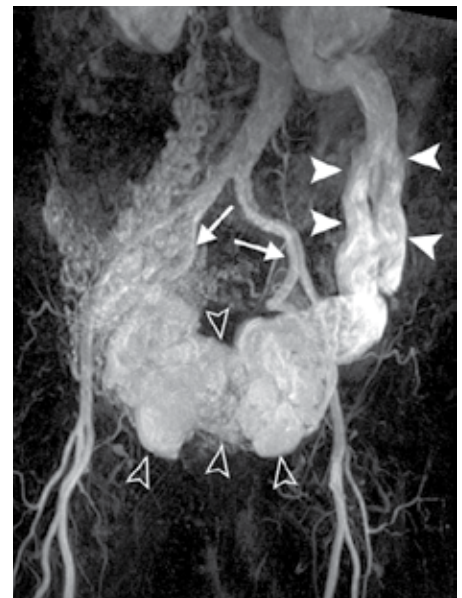
In an article published in the May-June issue of *RadioGraphics* (RSNA.org/RadioGraphics), Gregor M. Dunham, MD, of the University of Washington in Seattle, and colleagues review the role of imaging in diagnosis, workup and posttreatment evaluation of AVMs. Non-central nervous system

RadioGraphics

AVMs are characterized by progression and recurrence, often requiring aggressive management.

Imaging plays a crucial role in diagnosis and monitoring. Ultrasonography allows easy confirmation of suspected AVMs with limited evaluation of adjacent structures. MR angiography is the preferred imaging modality, enabling characterization of the AVM component vessels, as well as soft-tissue or bone involvement. CT should be reserved for evaluation of acute symptoms. Angiography is historically the reference standard for diagnosis but currently is frequently reserved for treatment planning.

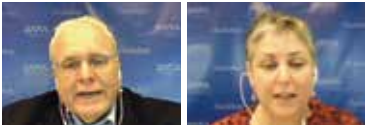
"AVMs inherently progress and have a high rate of recurrence after treatment. Imaging helps provide an accurate and early diagnosis, which can then be used to direct appropriate management, with embolization evolving as the primary therapy," the authors write.



Uterine AVM (Schobinger stage III) in a 58-year-old woman. Coronal contrast-enhanced MIP 3-D MR angiogram shows a large uterine AVM (▷) with supply from the bilateral internal iliac arteries (→) and main drainage via the left gonadal vein (▶).

(*RadioGraphics* 2016;36:891-903) ©RSNA 2016. All rights reserved. Reprinted with permission.

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



Radiology PODCASTS

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

- ▣ “MR Fingerprinting for Rapid Quantitative Abdominal Imaging,” Yong Chen, PhD, and colleagues.
- ▣ “Virtual Monochromatic Images from Dual-Energy Multidetector CT: Variance in CT Numbers from the Same Lesion between Single-Source Projection-based and Dual-Source Image-based Implementations,” Achille Mileto, MD, and colleagues.
- ▣ “Dealing with Uncertainty in CT Images,” Joel G. Fletcher, MD, and colleagues.
- ▣ “Quantitative Features of Liver Lesions, Lung Nodules, and Renal Stones at Multi-Detector Row CT Examinations: Dependency on Radiation Dose and Reconstruction Algorithm,” Justin Solomon, MS, and colleagues.

Residents & Fellows Corner

Residents Focus of Latest RSNA Professionalism Vignette

Residents are invited to view the latest RSNA Professionalism Vignette—“Professionalism from the Resident’s Perspective”—available at RSNA.org/Professionalism (right).

Developed by the RSNA Professionalism Committee, each vignette depicts a complicated, multifaceted scenario, raises questions about how to handle various aspects of the issue and provides responses that discuss the relevant principles of professionalism. References are provided for further study.

The newest vignette is one of 11 covering a wide range of topics radiologists may encounter, including sexual harassment, partner relationships, disclosure of radiological errors, hiring practices and workplace discrimination. New topics are in development.

The vignettes are intended to raise awareness of the need for radiologists to maintain professionalism in their routine practice and to facilitate discussion of this core competency.



Value of Membership

RSNA Career Connect™ Links Radiology Professionals to Open Positions

Visit the newly updated RSNA Career Connect™ to search for the perfect job or fellowship position.

Search postings or create a search to receive email notifications as jobs become available.

- **Post your Resume**—Allow potential employers to view your job experience.
- **Post a Position**—List career opportunities and available fellowships and attract highly qualified candidates.

Visit Career Connect at RSNA.org/Careers.

For assistance with fellowship postings, contact Betsy Lockett at fellowshipconnect@rsna.org.

Education and Funding Opportunities

Essentials of Radiology on Flash Drive

RSNA's *Essentials of Radiology* on flash drive includes more than 14 hours of audiovisual material previously available only at the RSNA annual meeting. The collection highlights a broad spectrum review of top-level knowledge essential for general radiologists, residents and subspecialists.

Brush up on the essential skills of radiology in subspecialty areas including: breast imaging, cardiac imaging, chest imaging, genitourinary imaging, musculoskeletal imaging, neuroimaging, pediatric imaging, postoperative gastrointestinal imaging and ultrasound. In addition, this collection also provides a close look at non-interpretive skills that are relevant to radiologists in their everyday practice.

With clear and detailed presentations by well-known speakers, the content is perfect for academic lectures, offering topics such as "Evaluation of Adult Congenital Heart Disease with CT (Cardiac Imaging)," "The Mediastinum: A Case-Based Approach (Chest Imaging)," "Pattern-based Approach to White Matter Disease (Neuroimaging)," and "Pediatric Ingested Foreign Objects: Recognition and Triage (Pediatric Imaging)."

Along with clinical and diagnostic essentials, users can also access content covering trending non-interpretive skills for radiologists such as "What Every Radiologist Needs to Know about Medicare" and "Quality—What is it and How to Improve It."

Essentials of Radiology can be purchased at RSNA.org/Essentials-of-Radiology or go to RSNA.org/eLearn and click the banner at the top of the page. The fee is \$175 for RSNA members, \$250 for non-members.



Final call for Applications: RSNA Clinical Trials Methodology Workshop

Jan. 7-13, 2017
Deadline for Application
June 15, 2016

Over the course of this 6 ½-day workshop, participants will learn how to develop protocols for the clinical evaluation of imaging modalities. Each trainee will be expected to develop a protocol for a clinical study, ready to include in an application for external funding. 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. Familiarity with basic concepts and techniques of statistics and study design is required of all applicants. Once admitted, trainees participate in group and individual learning, including preparative readings, didactic sessions, one-on-one mentoring, small group discussions, self-study and individual protocol development. Accepted participants are responsible for all travel expenses and hotel accommodations. There is no fee for this workshop. Online application and additional information are available at RSNA.org/CTMW. Questions can be directed to dor@rsna.org or Rachel Nelson at 1-630-368-3742.

Applicants Sought for RSNA Derek Harwood-Nash International Fellowship

Deadline for Application
July 1, 2016

The Derek Harwood-Nash Fellowship program supports international scholars pursuing careers 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 six- to 12-week fellowship period. Applications will be accepted through July 1.

Interested candidates must be promising international radiology scholars who have completed their radiology training, are embarking on a career in academic radiology (i.e., have held a faculty position for three to 10 years), and who demonstrate that their specific educational goals can be met most appropriately by a course of study in a North American institution.

Applications are available at RSNA.org/DHN. For more information, e-mail CIRE@rsna.org.



RSNA Advanced Course in Grant Writing

Deadline for Application
July 1, 2016

Applications are now being accepted for this course designed to assist participants — generally junior faculty members in radiology, radiation oncology or nuclear medicine programs — prepare and submit a National Institutes of Health, National Sciences Foundation, or equivalent, grant application. The course, held at RSNA Headquarters in Oak Brook, Ill., will consist of four 1 ½-day sessions:

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

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

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



NEW FOR 2016: Introduction to Academic Radiology for Scientists (ITARSc)

Deadline for Application
July 1, 2016

RSNA is expanding the Introduction to Academic Radiology (ITAR) program to include up to eight postdoctoral fellows in the imaging sciences and biomedical engineering. Postdoctoral fellows in these specialties who received their degrees within the past six years are invited to apply for the opportunity to participate in this dynamic program held during the RSNA annual meeting in Chicago, Nov. 27-Dec. 1, 2016.

Program objectives:

- Introduce participants to the scope of research in the radiologic sciences
- Highlight the important role of postdoctoral degrees in the radiologic sciences
- Identify keys to success for postdoctoral scientists in imaging research
- Introduce participants to successful radiologic researchers who may serve as future mentors

The program consists of a combination of dedicated programming for ITARSc participants, and shared sessions with participants of the ITAR program.

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

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

RSNA/AUR/ARRS Introduction to Academic Radiology Program

Nominations/application deadline:
July 15, 2016



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 annual meeting in Chicago, Nov. 27 to Dec. 1, 2016, or the ARRS annual meeting in New Orleans, April 30 to May 5, 2017.

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

Annual Meeting Watch

News about RSNA 2016

Advance Registration and Housing Open

Member registration and housing is now open. Non-member registration and housing opens at 10:30 a.m. Central Time (CT), Wednesday, June 1. Register at RSNA.org/Register.

Reserve Your Room

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

- Experient is the official housing partner for the RSNA Annual Meeting. For more information visit, RSNA.org/Register or email reginfo@rsna.org.
- E.S.A. Voyages is the official international travel partner for groups, providing a variety of international travel packages including airfare and hotel. For more information, contact esa@esavoyages.fr.

- ACE is the official travel partner for groups coming from China and Taiwan, providing travel and hotel packages. For more information, contact stephaniezhu@acemarketing.com.cn.

Hotel reservations booked through these official housing partners are the only approved method to guarantee RSNA's discounted rates. Do not risk your credit card or hotel reservation — unauthorized hotel solicitors have unfortunate and expensive consequences. Please be aware of and report any unauthorized solicitation to housing@rsna.org.

Secure your reservations early for

the best selection and access to these great benefits:

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

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



NEW FOR 2016: Badge materials will be mailed to all professional attendees registered by Oct. 1. For registrations processed after Oct. 1, badges will be available for pickup at McCormick Place. Register early to help save trees and reduce the number of duplicate badges RSNA prints to replace those lost in the mail or forgotten at home.

RSNA® 2016

Important Dates for RSNA 2016

June 1	Non-Member Registration and Housing Open at 10:30 a.m. Central Time (CT)
July 27	RSNA Online Program Opens
Nov. 4	Final Discounted Registration Fee and Housing Deadline at 5 p.m. Central Time (CT)
Nov. 5	Increased Registration Fee Applied, \$150 for most categories
Nov. 27 – Dec 2	102 nd Scientific Assembly & Annual Meeting
Dec 23	Virtual Meeting closes

Registration Fees - On or Before November 4

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

*Register for the RSNA Annual + Virtual Meeting Package and get access to both the physical meeting at McCormick Place and the Virtual Meeting.

New R&E Website Makes Gift Planning Easier

Interested in making a lasting investment to the RSNA Research & Education (R&E) Foundation? Visit the new website, RSNA.org/LegacyGiving to find out how.

On the new site, users can:

- Find the right gift based on age, assets or the amount to give
- Learn about ways to give and how to fund your gift
- Download brochures and watch videos on popular types of gifts
- See the potential benefits with the Gift Illustrator tool
- Set plans in motion with the Personal Estate Planning Kit

Four charitable gift options are available to help support the R&E Foundation's future work and define your legacy. Each of these gifts supports the Foundation's important programs:

- Gift in your will or revocable living trust
- Gift of retirement plan assets
- Charitable gift annuity
- Charitable remainder trust



Contact Robert Leigh, Manager, Fund Development, at 1-630-590-7760 or rleigh@rsna.org with questions or to share feedback.

**COMING
NEXT
MONTH**

Next month, *RSNA News* examines the latest tools and techniques being used to improve the way radiology residents learn.

Linking Radiology Professionals and Available Positions



RSNA Career Connect™

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- Easily apply online
- Save up to 100 positions or fellowships
- Complimentary and confidential resume posting

Post a Position

- Target radiology professionals
- Easy online management
- Search for prospects and set criteria
- Include company information and website link

LEARN MORE AT:
RSNA.org/Careers

RSNA Career Connect™