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LOOK AHEAD: The Vast Potential of Neuroimaging

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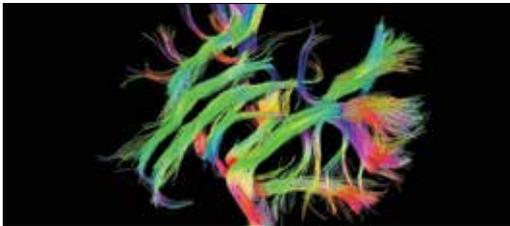


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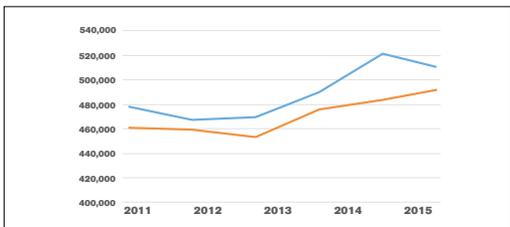
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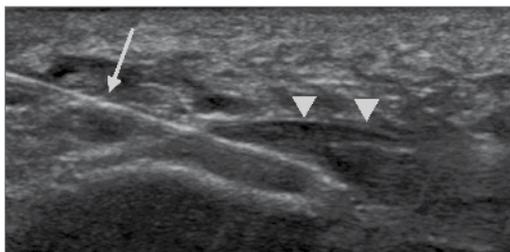
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The RSNA promotes excellence in patient care and healthcare delivery through education, research and technologic innovation.



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Bluemke Named New Editor of *Radiology*

RSNA's Board of Directors announced that David A. Bluemke, MD, PhD, will become editor of the RSNA journal *Radiology* in January 2018.

Dr. Bluemke is the radiologist-in-chief of Radiology and Imaging Sciences at the National Institutes of Health (NIH) Clinical Center and senior investigator at the National Institute of Biomedical Imaging and Bioengineering (NIBIB) in Bethesda, Md. He is adjunct investigator for the National Heart, Lung and Blood Institute (NHLBI).

"*Radiology* is the premier journal in our field, with a strong focus on innovation in imaging," Dr. Bluemke said. "In order to lead the field, the journal needs to publish cutting edge research articles in radiological imaging. Such topics are often highly specialized. Therefore, the journal will provide increased editorial content to explain the significance of novel research findings. In this way, we can all benefit by a better shared understanding of new research results and their impact on our clinical practices."

Dr. Bluemke's research interests lie in cardiovascular disease and its complications, with his primary focus on atherosclerosis imaging and the use of traditional and molecular imaging techniques to evaluate myocardial tissue. The aim of Dr. Bluemke's work is to employ imaging modalities to detect, quantify and monitor subclinical disease.

"As editor of *Radiology*, David will provide visionary leadership. He brings to the position a wealth of knowledge and experience, coupled with innovative ideas that will enhance appeal for the readers and further elevate the journal's impact factor," said Vijay M. Rao, MD, chair of the RSNA Board of Directors. "It is an

exciting time for *Radiology*."

A graduate of the University of Wisconsin at Madison, Dr. Bluemke earned his medical degree and his doctorate degree in biophysics from the University of Chicago. He completed a diagnostic radiology residency and a cross-sectional fellowship at the Johns Hopkins University (JHU) School of Medicine in Baltimore. He received a Master of Science in Business from JHU, as well as a Certificate in Business of Medicine. He has completed the Executive Leader Program at JHU and the NIH Executive Leadership program.

After his residency, Dr. Bluemke became an instructor and later an assistant professor of radiology at JHU School of Medicine. He served as an associate professor in the departments of Radiology and Medicine, and then as a professor in the departments of Radiology and Medicine.

He became the clinical director in the MRI division of the Department of Radiology at Johns Hopkins Hospital. In 2008, he became a tenured senior investigator for the NIH and radiologist-in-chief at the NIH Clinical Center a position he still holds.

Dr. Bluemke served as deputy editor of *Radiology* from 1993 to 1997. He has served on the editorial boards of several journals, including the *Journal of Magnetic Resonance Imaging*, *Journal of Computed Axial Tomography*, *Applied Radiology* and the *International Journal of Cardiovascular Imaging*. Dr. Bluemke has co-authored more than 600 peer-reviewed publications, 540 scientific abstracts, and 38 book chapters and monographs. He has been a reviewer for more than 35 scientific journals, including *Radiology*, *RadioGraphics*, *Journal of the American Medical Association* and *New England Journal of Medicine*.



"David Bluemke is an experienced scholar and leader in radiology," said Mary C. Mahoney, MD, RSNA Board liaison for publications and communications. "He has the vision to guide the journal through the changes on the horizon with the digital age and keep the journal relevant and vital to our readers and our researchers."

Dr. Bluemke will succeed Herbert Y. Kressel, MD, as *Radiology* editor. Dr. Kressel has served the journal since 2007 and will retire as editor at the end of 2017. During his tenure, Dr. Kressel introduced new journal innovations and features, such as the *Radiology* Select collections of essential modality articles and various online enhancements, such as *Radiology* podcasts with study authors. Dr. Kressel also instituted operational efficiencies, improved the scientific rigor of the journal through the institution of author and reviewer checklists, and increased author recognition through the development of the Alexander R. Margulis Award for Scientific Excellence.

A full press release is posted at RSNA.org/News.

Numbers in the News

2.7

Percentage increase for salaries of interventional radiologists in 2015. Salaries for non-interventional radiologists increased by 1.4 percent last year. Read more on [Page 9](#).

1,540

Number of imaging scans performed during the 2016 Summer Olympics. Read about radiology's role in bringing imaging to Olympic athletes on [Page 7](#).

400

Number of trainees who turned out to hear radiology professor Vikram Dogra, MD, lecture during a trip to Mexico through the RSNA International Visiting Professors (IVP) program. Read more about 2016 IVP trips on [Page 11](#).

Jackson, Becker among Endowed Professorships at Indiana University

RSNA Board of Directors Liaison for Education **Valerie P. Jackson, MD**, past RSNA president **Gary J. Becker, MD**, **Dean D. Maglinte, MD**, and **Heun Yune, MD**, were recently honored with endowed professorships by the Indiana University (IU) School of Medicine's Department of Radiology and Imaging Sciences.

Endowed professorships in education were established in the names of Drs. Jackson and Maglinte.

Dr. Jackson, executive director of the American Board of Radiology, served as radiology chair for 10 years and was the Eugene C. Klatte Professor of Radiology at IU. Her RSNA involvement includes serving as chair of the Refresher Course Committee, as an associate editor of *Radiology*, as a member of the Public Information Advisors Network and on the *RSNA News* Editorial Board. Dr. Jackson was RSNA first vice president in 2008-2009 and has served on the RSNA Research & Educa-

tion (R&E) Foundation Board of Trustees.

Dr. Becker spent 20 years at Indiana University and served as chief of the vascular and interventional section and professor of radiology. His RSNA involvement includes serving as chair and president of the RSNA Board of Directors and as a trustee for the RSNA R&E Foundation. Dr. Becker delivered the Annual Oration in Diagnostic Radiology at RSNA 2000 and received the RSNA Gold Medal in 2014. He currently serves on the *RSNA News* Editorial Board.

Dr. Maglinte, who has served RSNA as a faculty member at multiple annual meetings and as a *Radiology* Editorial Board member, is a Distinguished Professor of Radiology and Director of the Visiting Professors Program at IU.

Dr. Yune served at IU as director of the residency program and was awarded the John A. Campbell Professor of Radiology.



Jackson



Becker



Maglinte



Yune

SNMMI Announces New Officers, Award Winners



Schwarz



Greenspan



Minoshima



Strauss



Conti

Sally W. Schwarz, MS, Rph, BCNP, has been named the 2016-17 president of the Society of Nuclear Medicine and Molecular Imaging (SNMMI). SNMMI introduced a new slate of officers during its recent annual meeting in San Diego, Calif.

SNMMI also announced **Bennett S. Greenspan, MD, MS**, as the 2016-17 president-elect, and **Satoshi Minoshima, MD, PhD**, as the 2016-17 vice president-elect.

H. William (Bill) Strauss, MD, was awarded the Benedict Cassen Prize, often considered the Nobel Prize of nuclear medicine.

Peter S. Conti, MD, PhD, was named the 2016 recipient of the prestigious Paul C. Aebersold Award.

ECOG-ACRIN Breast Cancer Trial Recruitment Begins at RSNA 2016

Medical imaging providers will have the opportunity to sign up to participate in a new, large-scale breast cancer screening trial funded by the National Cancer Institute (NCI). The first such study in nearly 25 years, the Tomosynthesis Mammography Imaging Screening Trial (TMIST), led by the ECOG-ACRIN Cancer Research Group, will begin in mid-2017. TMIST will enroll 165,000 asymptomatic women in the U.S. and Canada to compare screening results of breast tomosynthesis vs. standard digital mammography.

Two presentations for interested medical facilities are planned at RSNA 2016. Sessions will be held Monday, Nov. 28, and Wednesday, Nov. 30. No pre-registration is required.

Visit <http://bit.ly/2eXy9O6> for more information.

RSNA Board of Directors Report

The RSNA Board of Directors met in September to select the next Radiology editor, appoint volunteers to committees for the coming year, approve RSNA participation in the meetings of other health organizations and review the Society's position statements.

RSNA 2016 Beyond Imaging

Plans for RSNA 2016 continue to move forward. The Board approved an additional Hot Topic session, "Zika—What the Radiologist Needs to Know." Moderated by Dr. Deborah Levine, the session will be held Monday afternoon. The board also approved a hands-on demonstration of deep learning capabilities related to medical imaging.

Radiology Editor Selected

The Board has selected David A. Bluemke, MD, PhD, to serve as the next *Radiology* editor. He will succeed Herbert Y. Kressel, MD, in 2018. Read more on Page 1.

New Position Statements

RSNA annually reviews position statements on important radiology-related topics and makes them available to the media. In September the Board approved two new position statements on Imaging of the Prostate and Safety of the Developing Fetus in Medical Imaging During Pregnancy. These and twelve other position statements are available for RSNA members to use as they speak to their patients or the press about important topics in radiology. They are posted in the Media section of RSNA.org.

Healthcare Collaboration

The Board agreed to share support with the American College of Radiology to send a representative to the World Health Organization International Workshop on Medical Imaging of Asymptomatic People for Individual Health Assessment. The decision was also made to send an RSNA-sponsored speaker to the 2017 American Physician Scientists Association Annual Meeting.

International Representation

In consideration of RSNA's significant Canadian membership it was agreed RSNA will add members nominated by the Canadian Association of Radiology to each of the following committees: Education Council, Committee on Scientific Affairs, *RSNA News* Editorial Board and the Resident and Fellow Committee. Also to better reflect the Society's worldwide membership the Board approved a Bylaw amendment making members from outside North America eligible to be elected to RSNA vice president positions.

Building on Success in Latin America

Building on the success of RSNA's first Spotlight Course held in Cancun in 2016 the Board approved a 2017 course to be held in Bogota, Colombia. The

course will focus on musculoskeletal imaging and ultrasound and will be led by course directors Jorge Soto, MD, and Gabriel Dib, MD.

RSNA Leadership Appointments

The work of the RSNA moves forward only with the immense support of its volunteers. The Board was pleased to appoint members to committees and leadership roles across the Society. On behalf of the Board I am grateful for the talent and generosity of all RSNA volunteers.



VIJAY M. RAO, MD
Chair
RSNA Board of Directors

THIS MONTH IN THE RSNA NEWS ONLINE VERSION

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

After reading about the role of radiology at the Olympics in this month's issue, go to RSNA.org/News to access the 2016 Sports Imaging Series in *Radiology* featuring six anatomically-based articles on sports imaging.



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LOOK AHEAD

The vast potential of neuroimaging

BY MAX WINTERMARK, MD, MAS, MBA

During the past decade, we have seen an explosion of innovation in structural and functional neuroimaging techniques, providing exciting insights into new aspects of the human brain that transcend simple visualization of anatomy. New scanners that are faster with better image quality and higher magnetic field strength — as well as higher spatial and temporal resolution — allow fully quantitative assessment of the brain, including macroscopic structure, microstructural organization, functional connectivity, perfusion and metabolism. The resultant exponential increase in highly granular neuroimaging data that can be rapidly acquired creates challenges — but also opportunities — for better characterization of neurological, neurosurgical and psychiatric disorders that arise from complex central nervous system dysfunction.

Indeed, neuroimaging is now appropriately recognized as a big data technique, sharing similar needs with other data-rich methods for further innovation in analysis and meaningful information extraction, as well as for integration with the other big data disciplines such as genomics and proteomics. There is a continued need for this technology to be translated from basic “bench top” science into clinical practice, so that these remarkable advances in the ability to characterize the brain can benefit patients. Critical to meaningful clinical translation is comparative effectiveness and outcome research to gain widespread acceptance in the modern, economically constrained healthcare system.

This article illustrates different facets of these innovative anatomical and functional neuroimaging techniques and discusses their potential as clinical tools for evaluating the breadth of diseases affecting the brain.

The Rise of Quantitative Neuroimaging

The advent of quantitative analysis has pushed neuroimaging to the forefront of brain research, diagnosis and clinical trials.

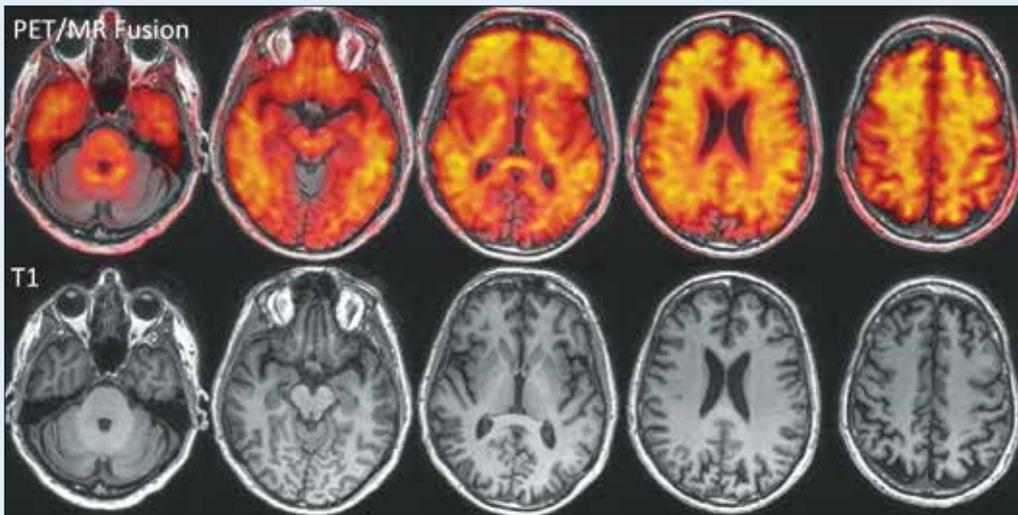
Quantitative assessment of cerebral tissue and function provides the potential for unbiased reproducible evaluation as compared to more traditional qualitative visual interpretation. Quantitative neuroimaging approaches have begun to permeate clinical practice due to the work of disease-specific consortia. For example, the Alzheimer’s Disease Neuroimaging Initiative (ADNI) has collected MRI, PET, genetics, cognitive testing, cerebrospinal fluid and blood biomarker data for investigating potential predictors of Alzheimer’s disease (AD). Commercially available processing tools developed from this endeavor provide quantitative volumetric measurements of hippocampi and cerebral hemispheres. These tools facilitate the assessment of changes in brain volumes over time for characterizing the progression of mild cognitive impairment to AD.

Quantitative neuroimaging is a critical part of clinical trials using longitudinal and cross-sectional study designs, with neuroimaging biomarkers for treatment selection and/or monitoring. Examples include imaging-based clinical trials of stroke, multiple sclerosis, and brain tumor therapies, where final infarct volume, evolving number of white matter lesions and evolving size of enhancing/non-enhancing



Wintermark

MAX WINTERMARK, MD, is professor of radiology and chief of neuroradiology at Stanford University Medical Center, Palo Alto, Calif. Dr. Wintermark is chair of RSNA’s Public Information Committee. He serves as co-chair of the Research Committee of the American Society of Neuroradiology and chair of the imaging working group of the Stroke Trials Network of the National Institute of Neurological Disorders and Stroke.



A PET-MRI scan obtained in a 73-year-old male patient, Apolipoprotein (APO)-E4 homozygous, 90-110 minutes after administration of 5.4 mCi Flortetaben (Neuraceq). While this patient was cognitively normal, the positive beta amyloid scan together with his APO-E4 status puts him at increased risk to develop Alzheimer's disease. Image courtesy of Greg Zaharchuk, MD, PhD.



ON THE COVER: The Human Connectome Project makes data available for large-scale studies about the human connectome. Above: White matter fiber architecture from the Connectome Scanner dataset. The fibers are color-coded by direction: red = left-right, green = anterior-posterior, blue = ascending-descending.

tumor respectively, are used as intermediate/secondary endpoints to evaluate disease progression and effects of intervention. Though still not accepted by the Food and Drug Administration as primary outcome measures, such research is laying the groundwork for future clinical practice.

Mapping the Human Brain

As a new paradigm for understanding — or mapping — the human brain, connectomics is opening new windows in brain imaging and research. Connectomics aims to understand the structural connectivity of brain networks, representing physical connections such as axons or fiber tracts. Structural connectivity can be observed at the level of individual synapses (microconnectome) or at the level of fiber tracts between brain regions (macroconnectome).

Structural MRI, such as diffusion-tensor imaging and diffusion-spectrum imaging can provide information regarding structural connections of the macroconnectome. Functional MRI methods, such as blood oxygen level dependent imaging acquired during the resting state can provide information regarding functional connectivity. Functional connectivity can also be studied by measuring the electrical and magnetic activity associated with neuronal depolarization using electroencephalography and magnetoencephalography, respectively.

Similar to genomics, the hope is to use structural and functional connectomics as a clinical tool to identify biomarkers of disease as well as to classify individual patients into diagnostic/prognostic groups and to predict outcomes related to therapeutic interventions.

A number of hurdles must be overcome before diseases can be diagnosed and treated based upon the imaged connectome. Indeed, the pathophysiology of many diseases may result in relatively subtle abnormalities of the brain's functional or structural connectome compared to healthy controls. In addition, a given brain disorder may affect any one of numerous individual networks or a combination thereof.

Methods to distinguish between group differences in the connectome, as are frequently reported in the literature, may be insufficient to diagnose disease in individual patients. As such, analysis tools to identify abnormalities of the connectome with high sensitivity and specificity for individual subject classification must be developed before meaningful clinical translation can be realized. In this regard, the field of connectomics is currently building large databases such as those developed by the Human Connectome Project and 1000 Functional Connectomes Project, for conducting large-scale studies that may begin to better define the range of normal and abnormal with respect to the human connectome.

A better understanding of brain function/dysfunction may also result from new simultaneous PET-MRI scanner technology. For studying brain physiology, simultaneous acquisition may allow improved in-vivo assessment of multiple neuropsychologic processes such as changes in cerebral hemodynamics including cerebral blood flow, volume and oxygenation as well as the relationship between metabolism and oxygen consumption (neurovascular coupling). Novel molecular probes enable direct imaging of neuro-inflammation and microglial activation, hypoxia, necrosis and apoptosis. Other disorders associated with changes in mental status such as depression, dementia, schizophrenia and obsessive-compulsive disorders, will be characterized in new ways by combining anatomic, functional and metabolic measurements during identical examination conditions, creating opportunities impossible to duplicate using sequentially acquired data.

Embracing Outcomes Research and Comparative Effectiveness

In the current healthcare climate, it is insufficient to develop and translate innovative neuroimaging tools into clinical practice without demonstrating cost-effective improvements in clinical outcomes. Radiology — like all of healthcare — needs to embrace outcomes and comparative effectiveness research.

Outcomes research is applied clinical- and population-based research that studies and optimizes the end results of healthcare in terms of benefits to the patient and society. This research aims to identify shortfalls in practice and to develop strategies to improve care. Like clinical trials, outcomes research seeks to provide evidence about which interventions work best for specific types of patients and under what circumstances.

However, while traditional clinical trials focus primarily on therapeutic efficacy and safety, outcomes research may consider additional parameters such as cost, timeliness, convenience, geographical accessibility and patient preferences. Consequently, the field is more multi-disciplinary, involving not only neuroimagers and other healthcare providers, but also medical economists, sociologists and public health researchers, as well as

manufacturers of medical devices and pharmaceuticals.

Shedding New Light on Understanding the Brain

Going forward, imaging will continue on its already remarkable path in brain research. In fact, three of the top five medical innovations of the last 25 years, as ranked by physicians, are related to imaging: MR and CT imaging balloon angioplasty and mammography. These techniques are now firmly integrated into clinical practice and radiology as a discipline deserves tremendous credit for the successful integration of physics and computer technology with clinical applications.

While we can barely fathom the developments that lie ahead, it is certain that they will shed new light on our understanding of the brain, its miraculous structure and function, as well as the diseases that plague it. In turn, this

will open the door to new therapies and cures for the neurological, neurosurgical and psychiatric disorders that affect innumerable patients and levy profound devastation on so many families.

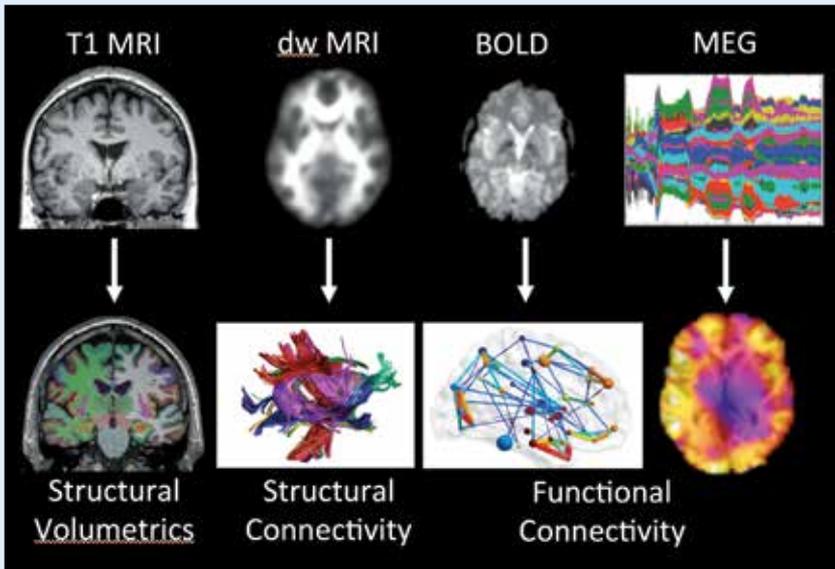
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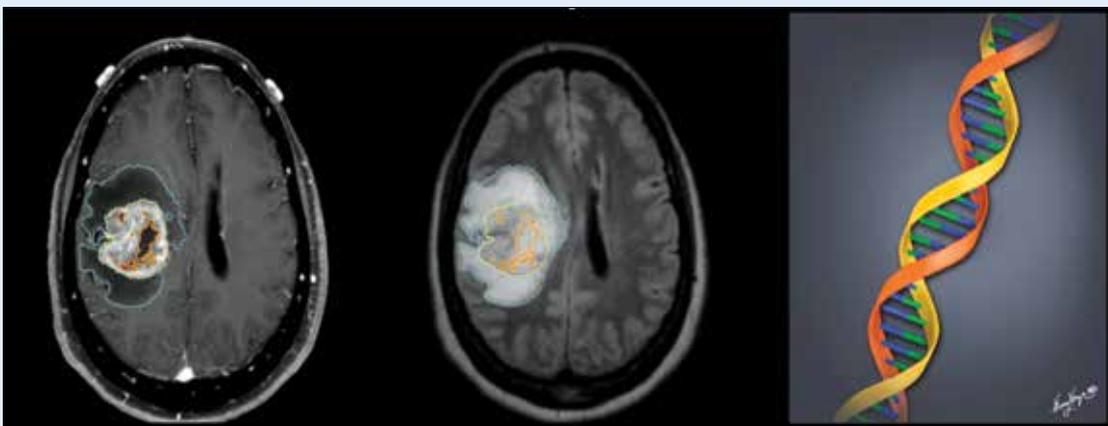
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Editor's Note: For a full list of references in this article, go to RSNA.org/News.



Left: A big data approach to neuroimaging data allows for the extraction of quantitative neuroimaging features. *Image courtesy of Christopher T. Whitlow, MD, PhD.*



Radiogenomics for brain tumors consists of combining the imaging phenotype with the genotype to improve characterization of these tumors as well as outcome prediction in patients affected by these tumors. *Image courtesy of Rivka Colen, MD.*

Role of Imaging Accelerates at Summer Olympics

BY RICHARD DARGAN

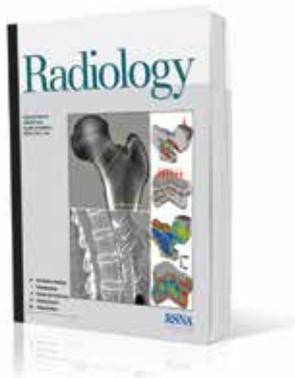
While spectators around the world were treated to thrilling competition at the Summer Olympics in Rio de Janeiro, Brazil, some of the most critical moments took place away from the spotlight where scores of volunteer radiologists and technologists brought advanced imaging technology to injured athletes.

“We had the best machines and some of the best musculoskeletal radiologists in Brazil to interpret the scans.”

RICHARD BUDGETT, MD

Radiology Publishes Sports Imaging Series

Radiology published a special Sports Imaging Series in 2016 featuring six anatomically-based articles on sports imaging. Articles in the series include, “Elbow Imaging in Sport,” “Imaging of Sports-related Hand and Wrist Injuries,” and “Imaging of Athletic Injuries of Knee Ligaments and Menisci.” Access the entire Sports Imaging Series at RSNA.org/Radiology.



Throughout the Olympics, the imaging suite was one of busiest areas of the Polyclinic, a 3,500-square-meter health-care facility located in the middle of the Olympic Village. During the games, 1,540 imaging studies were performed over the 16 days, including 469 x-rays, 893 MRIs and 178 ultrasound exams. Imaging of the knees, lumbar spine, ankles and shoulders were most common.

“Seeing the state-of-the-art equipment at the Polyclinic gave the athletes and medical staff fantastic confidence,” said Richard Budgett, MD, medical and scientific director of the International Olympic Committee (IOC). “The team doctors have come to rely considerably on radiologists and they were really impressed with what was accomplished.”

Work began in earnest on the Polyclinic in 2009 after Rio de Janeiro became the first South American city ever to be selected to host the Olympic Games. General Electric (GE), an IOC sponsor, worked closely with Brazilian authorities to coordinate delivery of the imaging equipment and pave the way for the use of electronic medical records (EMRs), which had never been used before at the Olympics.

“It took a lot of work by a lot of people to get the Polyclinic going,” Dr. Budgett said. “There were more than 3,000 staff members coming to work twice daily during training.”

Athletes with painful muscles and joints crowded the Polyclinic during the games. As is often the case, some memorable Olympic moments involved injuries, such as when French gymnast Samir Ait Said broke his leg during a vault, or when American Abbey D’Agostino limped to the finish after stopping to help New Zealand runner Nikki Hamblin get up after a fall during a 5,000-meter heat. Athletes with more serious injuries were transported to the hospital, while others

were taken to the Polyclinic. Care for the injured athletes required close coordination among international federation doctors, team doctors and ambulance staff.

“It was like working in a goldfish bowl,” Dr. Budgett recalled. “You’re in a situation where everyone watching the games knows about the injuries, and you have to make sure there’s a chain of communication so that the right people are informed immediately.”

Olympic Imaging Evolves Over Three Decades

The technology used at Rio 2016 exemplifies the rapid evolution of sports imaging over the past three decades, according to Dr. Budgett, who has a unique perspective on the issue.

Dr. Budgett — who earned a gold medal for rowing for the United Kingdom at the 1984 Olympic Games in Los Angeles — was named British team doctor at the 1992 Winter Games in Albertville, France.

“In those days, things were done on a much smaller scale,” he remembered. “We had one x-ray machine, no ultrasound and MRI was done offsite.”

In the 2006 Olympic Games in Torino, Italy, GE provided Dr. Budgett with an ultrasound scanner, a harbinger of the increasingly important role the technology would play in future games.

At the 2016 Olympics, GE’s Vscan, a portable ultrasound tool the size of a smart phone, was often the first step in imaging injured athletes. Those with more complex injuries or indeterminate findings would then be turned over to the specialist radiologists in the Polyclinic offering more sophisticated ultrasound, MRI, CT and x-ray equipment.

“We were able to use individualized protocols to optimize scans,” Dr. Budgett said. “We had the best machines and some of the best musculoskeletal radiologists in



The Olympic Games Polyclinic (above) was equipped with the latest diagnostic imaging technologies as well as data and record management to help doctors treat and track athletes. Image courtesy of GE Communications.

Radiologists were integral to the Olympic medical team: (from left) Rômulo Domingues, MD, consultant radiologist, Jörg F. Debatin, MD, Vice President, Chief Technology and Medical Officer, GE Healthcare, and Roberto Domingues, MD, radiologist, pictured in the imaging suite at the Polyclinic. “We are very proud both as members of the Olympic medical team — and as Brazilians — of having participated in one of the most successful Olympic Games ever,” Rômulo Domingues, MD, said.

Brazil there to interpret the scans.”

One of those radiologists, Rômulo Côrtes Domingues, MD, who chose the team of radiologists and volunteer technicians, said the team’s work was critical to athletes at the games.

“Musculoskeletal radiology is of the utmost importance because the majority of injuries related to the athletes come from the musculoskeletal system: bones, tendons, muscles, cartilages, ligaments, menisci, labra and nerves,” Dr. Domingues said. “In such cases, we gave a prompt report enabling the delegation of doctors to decide upon the best conduct.”

The use of EMRs also had a dramatic impact on care at the games by enabling physicians to connect the diagnosis and treatment of all Olympians while providing a digital record to enhance their post-game medical care.

“Through EMRs, doctors tracked thousands of data points on each athlete, analyzed that data in near real-time and coordinated care with providers from all over,” said Daurio Speranzini Jr., MBA, who heads Latin American operations for GE Healthcare. “The digital solution permitted reliable information and helped to ensure the exact medical history of each athlete.”

The use of EMRs is expected to have a major impact on the Olympic Games going forward, according to Dr. Budgett, who competed at a time when health information about athletes was jotted

down on cards or pieces of paper — if it was recorded at all.

Today, EMRs provide longitudinal surveillance of athletes, helping to predict what injuries and illnesses are most common over time while making it easier for multidisciplinary teams, including radiologists, orthopedic specialists and other healthcare workers, to share information.

For instance, surgeries for the U.S. Women’s Olympic wrestling team were reduced by 60 percent after EMRs were adopted, according to the U.S. Olympic Committee (USOC). Officials attributed the reduction in part to the ability of EMRs to translate data into insights and identify trends that can inform changes in training and care.

“Athletes have benefited from this solution, getting faster diagnoses and treatments and receiving more assertive handling that enabled their faster physical recoveries, along with increasing their chances of avoiding unnecessary procedures,” Speranzini said.

The IOC’s Medical and Scientific Commission is encouraging institutes, National Olympic Committees and squads to take up EMRs and use them throughout the four-year period between Olympic Games to monitor athletes and assess treatment effectiveness by different practitioners with the hope of preventing injury and illness from occurring.

An earlier version of an EMR developed specifically for the USOC was used

successfully during the London 2012 and the Sochi 2014 Games. At the Sochi 2014 Paralympic Winter Games, an athlete suffered a brainstem injury after a fall in the snow, compromising his breathing. By the time the athlete arrived in Frankfurt, Germany, for additional care, he was not able to speak.

“When the medical team accessed his health record on the smart phone, they could verify that he had allergies, which would influence his treatment, and they could see the number of anticoagulants he had ingested,” Speranzini said.

The equipment used at the Polyclinic in the 2016 Summer Olympic was also used for the Paralympic Games held in September 2016. Rio 2016, the Brazilian nonprofit association that sponsored the games, is donating the equipment to hospitals in Brazil.

In addition, GE donated 24 pieces of equipment to Rio de Janeiro’s Souza Aguiar Municipal Hospital, one of the biggest emergency hospitals in Latin America and the main public trauma hospital in the city. The donation enabled hospital officials to replace some outdated imaging equipment with more advanced technology and provide a PACs for the renovated radiology clinic.

“This new medical equipment will bring speed and safety to patient care and increase by 30 percent the potential operations performed by the institution per month,” Speranzini said.

Radiology Salaries Show Steady Increase in 2015

BY MIKE BASSETT

Radiology again experienced compensation increases in 2015, continuing a trend from the two previous years, according to the 2016 American Medical Group Association's (AMGA) Medical Group Compensation and Productivity Survey.

The median compensation level for non-interventional radiology increased by 1.4 percent, climbing from \$483,660 in 2014 to \$490,399 in 2015, while the median compensation rate for interventional radiology increased by about 2.7 percent, rising from \$577,250 in 2014 to \$592,750 in 2015.

Those increases were in line with the 3.1 percent average increase experienced by physicians across the board, according to AMGA, which received survey responses from 260 medical groups representing 92,000 providers across a variety of specialties.

Although salary increases were relatively flat, radiologists remain one of the most highly compensated specialties, ranking behind only cardiothoracic surgery (\$645,112), cardiology/cath lab (\$584,118), orthopedic surgery (\$582,056), and gastroenterology (\$505,194) in terms of median salary, the survey shows.

Experts caution against reading too much into the numbers considering the rate of change within the healthcare environment.

"Dramatic changes can occur from year to year based on the way Medicare bundles

codes and the way they compensate," said Howard Forman, MD, professor of diagnostic radiology and biomedical imaging at Yale University. "This year's increase may be a slowed increase, but it's still an increase. And in particular, interventional radiology compensation growth rates are still robust."

It is also important to remember that results are based on relatively small sample sizes. For example, just 460 interventional radiologists responded to questions about compensation.

"That's a very small sample when you think of the size of interventional radiology across the nation," said Dr. Forman, who directs the healthcare management program in the Yale School of Public Health and teaches healthcare economics at Yale University.

Productivity Outpaces Compensation

While compensation for radiologists — particularly diagnostic radiologists — is growing slowly, productivity, represented by relative value units (RVUs), is rising at a faster rate. In 2015, RVUs increased by 3.5 percent overall in radiology, the survey shows.

And in fact, RVU rates have been

outpacing radiology compensation since 2012.

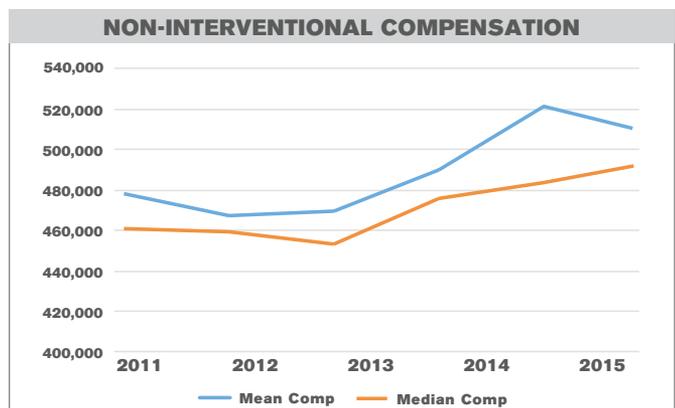
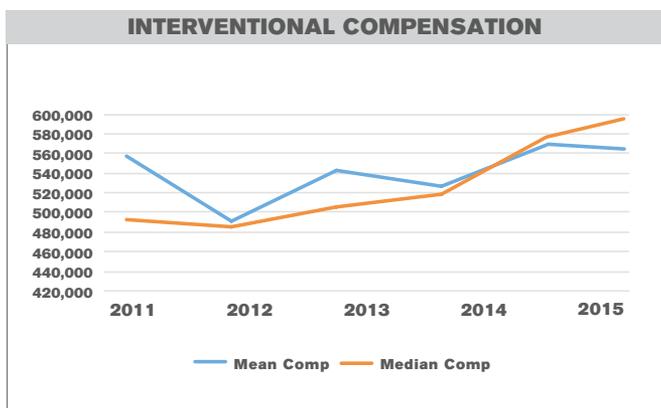
Over the past four years, the AMGA survey has shown that compensation for non-interventional radiologists has increased by 8.2 percent while RVUs have increased by 12.9 percent over the same time period.

"These numbers show that radiology's productivity and efficiency are definitely increasing," said Yuri Peterkin, MD, chief radiology resident at Winthrop-University Hospital in Mineola, New York, who presented research on RVUs in radiology at RSNA 2015 and has authored numerous articles on radiology reimbursement. "But productivity is increasing at a much faster pace."

Nevertheless, Dr. Forman sees a good deal of potential for radiology in these numbers.

"The RVU numbers show that radiology has a far, far greater ability to grow productivity than a lot of other fields," Dr. Forman said.

For example, internal medicine RVUs have increased by just 3.6 percent since 2012, while pediatric RVUs have actually decreased. Dr. Forman noted that even a field like general cardiology, which like



Radiology compensation increases in 2015 were in line with the 3.1 percent average increase experienced by physicians across the board, according to AMGA. Compensation levels for non-interventional radiology increased by 1.4 percent from \$483,660 in 2014 to \$490,399 in 2015, while median compensation rate for interventional radiology increased by about 2.7 percent, rising from \$577,250 in 2014 to \$592,750 in 2015.

Charts courtesy of the American Medical Group Association (AMGA).

“Radiology will continue to be one of the greatest beneficiaries of productivity gains.”

HOWARD FORMAN, MD



Forman



Peterkin

radiology is heavily based on procedures, experienced just a 3.7 percent increase in RVUs since 2012.

Radiology on an Upward Trajectory

In terms of radiology's future, Dr. Peterkin believes that while downward pressure on compensation will likely continue, radiology will continue to thrive because it is such a rapidly evolving, dynamic field. But he urges radiologists to embrace awareness and action — particularly concerning RVUs — as the specialty transitions to a pay-for-performance model.

“Radiologists need to be aware of and understand the RVU system, which will help them better understand their current productivity and reimbursement,” Dr. Peterkin said.

Dr. Forman said that he is quite optimistic about the future of the specialty on a number of fronts.

“Radiology will continue to be one of the greatest beneficiaries of productivity gains,” he said. “We have mastered the art of continuing to grow real productivity that's not making the radiologist work more hours in the day, or days in the week, but rather have more productive hours when we are working.”

Technology such as machine learning and artificial intelligence will further facilitate a radiologist's ability to interpret images and be more efficient in reporting and communicating findings, he said.

“So we might continue to face challenges in the sense that our reimbursements will continue to be cut,” Dr. Forman said. “And we'll continue to have to make the case we are adding value to the system and should be compensated appropriately. But, I think the trends for radiology continue to be stronger than many people seem to believe.”

Study: Women Radiologists Earn as Much as Male Colleagues



Jena

Not only is radiology a highly-compensated profession, but the specialty ranks as one of the few — if not only — medical specialties in which female practitioners earn as much as their male counterparts.

At least that's the conclusion of a recent analysis of salary differences by sex in U.S. public medical schools. The study, published in the August, 2016 issue of *JAMA Internal Medicine*, determined that radiology was the only specialty in which women's salaries were comparable to men's.

In the study, researcher Anupam B. Jena, MD, PhD, Harvard Medical School, the Ruth L. Newhouse Associate Professor of Health Care Policy at Harvard Medical School, and colleagues determined that, across all specialties, the mean salary for women was \$206,641, compared to \$257,957 for men — an absolute difference of \$51,315.

However, radiology bucked that trend. Results show that mean salaries for women (after multivariable adjustment) not only meet but actually surpass those of men (\$285,127 compared to \$282,749).

So why has radiology succeeded where other specialties have failed?

“I think this is really an open question and a source of potential remedies for other fields,” Dr. Jena said. “In a prior paper in *JAMA*, my colleagues and I found that female radiologists are equally likely as male radiologists to hold the rank of full professor, which was not the case in the majority of other specialties. More radiology-specific research is needed to identify why gender differences in promotion and compensation appear to be non-existent in radiology.”

Lucy Spalluto, MD, assistant professor of radiology and radiological sciences, Vanderbilt University Medical Center, co-director of the university's Women in Radiology initiative, pointed out that there has been a strong movement in radiology to promote diversity, equity and inclusion.

“This includes the efforts of many individuals and groups such as the ACR Commission for Women and General Diversity and the American Association for Women Radiologists,” said Dr. Spalluto, who is also associate director for Diversity, Equity and Inclusion for the Department of Radiology at Vanderbilt.

While the results of the study are encouraging, Dr. Spalluto cautioned that the study focused only on public university medical schools and not on private academic institutions or private practices.

“Additionally, the salary information obtained focuses on base pay,” Dr. Spalluto said. “There may be a large discrepancy not accounted for in the supplemental or bonus salaries often associated with higher rank faculty positions and leadership positions, the very types of positions in which women in radiology remain grossly underrepresented.”

Still, the study is promising for women in radiology, Dr. Spalluto said. “This research suggests that women are beginning to approach salary parity in radiology. And by doing so, we can serve as a model for success for other specialties.”

— Mike Bassett

RSNA Visiting Professors Leave Impact on Ghana, Mexico, Mongolia, Philippines

BY MARY HENDERSON

No matter which country RSNA's International Visiting Professors (IVP) visit, the response they receive is always the same.

RSNA Seeks IVP Host Countries

National radiology societies located in developing countries — or primarily serving those countries — are invited to apply to host an RSNA International Visiting Professor (IVP) team.

The host society will be responsible for organizing visits to local hospitals that have active radiology training programs with the need and potential for educational enrichment from a visiting professor team. If applicable, the team will also lecture at the host's national radiology meeting.

Host societies are expected to provide hotel accommodations and meals for the IVP team for the duration of their visit and communicate program, schedule and hospitality arrangements to the team members and RSNA staff.

The deadline to apply for the 2018 IVP program is Dec. 31, 2016. Find more information and download the applications at RSNA.org/IVP.

Become an International Visiting Professor

RSNA is looking for engaging radiologists from around the world who have a passion for teaching to become International Visiting Professors. For more information and to fill out an application, go to RSNA.org/IVP.

“The residents are always so thrilled that we are coming to lecture to them,” said Anne Roberts, MD, chief of vascular and interventional radiology, University of California, San Diego, a member of the IVP team that traveled to Ghana in February. “They are so appreciative.”

Since 1987, RSNA's IVP program has been sending radiologists to developing countries to lecture at the conventions of host radiology societies and to visit radiology training programs in local hospitals. Along with Ghana, IVP teams traveled to the Philippines, Mexico and Mongolia in 2016.

While earlier IVP visits were concentrated on conventional lectures, the format has evolved and is now a combination of one-on-one teaching, lectures and hands-on teaching, said Teresita Angtuaco, MD, part of the IVP team that traveled to the Philippines and former chair of RSNA's Committee on International Radiology Education (CIRE), which administers the IVP program.

IVP Professors Speak to Packed Venues

In Mexico, which is visited annually by an IVP team, radiologists spoke to packed houses during their September visit. Approximately 400 trainees and radiologists filled the lecture hall at the National Meeting of the Mexican Society of Radiology to hear IVP team member Vikram Dogra, MD, lecture on ultrasound and urology.

“It's very important for RSNA to be

involved in Mexico because they are our neighbors,” said Dr. Dogra, director of the Division of Ultrasound at the University of Rochester Medical Center, New York.

For the IVP program's February trip to the Philippines, crowds turned out to hear professors lecture at the convention of the Philippine College of Radiology in the capital city of Manila.

Along with Dr. Angtuaco, the IVP Philippines team included Sheila Sheth, MD, associate professor of radiology and radiological science at Johns Hopkins, Baltimore, Md., and Robert Harris, MD, professor of radiology and obstetrics and gynecology at Dartmouth College, Hanover, New Hampshire.

“Residents in the Philippines are so hungry to learn,” said Dr. Angtuaco, professor of radiology, obstetrics and gynecology, chief of ultrasound and director of the Division of Imaging at the University of Arkansas for Medical Sciences, Little Rock. “Many traveled all day just to come to a lecture.

“Local societies plan their hospital visits,” she said. “The Philippine College of Radiology decided to have their residents present cases to us. We were very impressed with their presentation skills and their ability to research a topic and work up the case.”

Overcoming Difficult Conditions

During the September IVP trip to Mongolia, the team lectured to approximately 200 attendees at the Mongolian Congress

“Residents in the Philippines are so hungry to learn. Many traveled all day just to come to a lecture.”

TERESITA ANGTUACO, MD



Mexico

During their trip to Mexico, IVP professors lectured at the XV Annual Course of Ultrasound organized by the Mexican Society of Radiology and Imaging and visited several local hospitals and teaching institutions.

of Radiology (MCR), sponsored by the Mongolian Radiology Society (MRS).

“They were very excited to have RSNA radiologists at the Congress,” said Carlos Torres, MD, former program director of neuroradiology at the University of Ottawa and part of the IVP team that visited Mongolia in September and attended the MCR. “They dedicated a full day to us with the title: MRS meets RSNA. Dr. Gonchigsuren, president of the Mongolian Society of Radiology, called it a historic event.”

Along with Dr. Torres, the Mongolia team included RSNA past-president Theresa C. McLoud, MD, thoracic radiologist and program director and vice chair for education at Massachusetts General Hospital, Boston, and Muşturay Karçaaltincaba, MD, professor of radiology and chief of CT at the Hacettepe University School of Medicine in Ankara, Turkey.

When visiting local hospitals in Mongolia, the disparities between the private and the public healthcare systems as well as the strengths and the limitations of radiology education in the host country was clear to IVP team members.

“The Mongolian private healthcare system is like North America with top-notch technology,” Dr. Torres said. “Government hospitals, however, mainly offer the basic modalities: x-rays, ultrasound, and CT and there is limited access to MRI. The radiology residents are predominantly observing throughout their training, with a perceived lack of hands-on experience.”

Still, he said members of the Mongolian Society of Radiology

Continued on page 17



Mongolia

The IVP team lectured to approximately 200 attendees at the Mongolian Congress of Radiology (MCR), sponsored by the Mongolian Radiology Society (MRS), during their trip to Mongolia.



Philippines

During their trip to the Philippines, the visiting professors gave presentations and taught intensive seminars to radiology residents, and attended conferences and meetings.



Ghana

Visiting professors who traveled to Ghana had high praise for the radiologists and radiology trainees they met during their trip.

Ultrasound-guided Procedure Effective for Treating Plantar Fasciitis

BY LYNN ANTONOPOULOS

Ultrasound-guided, platelet-rich plasma (PRP) injection may be a more effective treatment option for chronic, refractory plantar fasciitis than corticosteroid (SOC) injection therapy, new research demonstrates.

“We are really excited to leverage our experience from our RSNA-funded research to study a similar disease-tendon pathology in basketball and volleyball players.”

“There is currently no viable consensus treatment for those suffering from heel pain who fail the normal, conservative treatment forms but do not, or cannot, undergo surgery,” said Kenneth S. Lee, MD, associate professor of radiology at the University of Wisconsin (UW) School of Medicine and Public Health, Madison.

Plantar fasciitis is a common musculoskeletal disorder of the heel affecting an estimated two million Americans. Ten percent of the U.S. population will be affected over a lifetime with a significant socioeconomic cost.

Dr. Lee, who conducted the study through a 2010 Toshiba America Medical Systems/RSNA Research Seed Grant, said his objective was two-part. Primarily, he sought to determine the comparative efficacy of PRP injections versus corticosteroid (SOC) injections, which is considered the current standard of care, to treat subjects suffering from plantar fasciitis. Simultaneously, he used ultrasound (US) to measure changes of several pathologic features of plantar fasciitis and investigated acoustoelastography (AE) as a means to quantitatively evaluate healing response by measuring stiffness changes using standardized 0-3 severity scales.

Dr. Lee and colleagues enrolled 44 consecutive subjects over two and a half years. Inclusion criteria included unilateral plantar fasciitis, failed conservative therapy and a visual analog scale (VAS) pain level of at least five out of 10 for at least six months.

Recruiting suitable subjects who met the inclusion/exclusion criteria for the study was the main challenge, Dr. Lee said.

“We wanted to recruit patients affected by chronic plantar fasciitis with a pain level of moderate to severe who failed conservative therapy,” Dr. Lee said. “Our study population included those subjects who really had no other option except surgery.”

The subjects ranged in age from 30 to 64 years (11 male, 33 female). Patients were divided into two groups: 21 PRP and 23 SOC for the study conducted between March 2011 and July 2014. Each subject

received either a single injection of autologous PRP or a single injection of 1ml triamcinolone 40 mg/ml at week 0.

Several data points were obtained at baseline including VAS pain levels, validated clinical surveys (FAAM, SANE), ultrasound morphologic changes of plantar fascia thickness, hypoechoogenicity (grade 0-3) and hyperemia (grade 0-3).

Both pain and function levels were the same between the two groups at baseline. Both groups improved at weeks 8 and 16 but started to diverge by week 32, with subjects receiving PRP injections showing continued improvement while the SOC group started to rebound in their pain level.

FAAM scores improved for both groups, but the PRP group improved by 12.6 points more than SOC by week 32. Additionally, SANE scores improved over time, consistently favoring PRP.

Ultrasound Plays Vital Role in Research

Sarah Kohn, RDMS, research sonographer and program manager at UW, performed the ultrasound exams for the study. After using preliminary AE to establish a baseline, Kohn used US guidance to assist Dr. Lee during treatment.

“We followed a standard protocol to assess the diseased plantar fascia and also used ultrasound so I could help guide Dr. Lee to target the abnormal tissue while he was doing the procedure,” Kohn says.

Kohn used US two additional times on each subject several months after the procedure to gauge healing changes in the plantar fascia. Plantar fascial thickness and hyperemia decreased equally in both groups, but PRP showed greater echotexture improvement than SOC over time.

Results demonstrated that PRP was more beneficial than SOC in improving pain and function at 32 weeks, but longer duration studies are needed. In addition, the AE results were promising as a diagnostic metric.

Project supervisor Ray Vanderby, PhD, a professor of orthopedic surgery and bio-



Lee

medical engineering at UW, said the results are quite promising but do not eliminate the need for tracking pain scores and other clinical parameters.

“This research provides a quantitative tool to build on to track clinical efficacy as a treatment progresses and shows what aspect of the US images are most consistent with clinical changes,” Dr. Vanderby said.

Dr. Lee agrees. “Larger multi-armed studies are needed in order to establish PRP, or possibly other minimally invasive treatments, as the standard of therapy,” he said.

R&E Grant Leads to Further Research

Dr. Lee also received an RSNA Research Scholar Grant in 2013. He said he was privileged to work with fellow researchers in a dedicated research environment realized through the RSNA Research Seed and Scholar Grants.

“We learned a lot about conducting a randomized controlled trial,” he said. “The success was really dependent on a team science approach with multiple investigators and research personnel in a dedicated research space.”

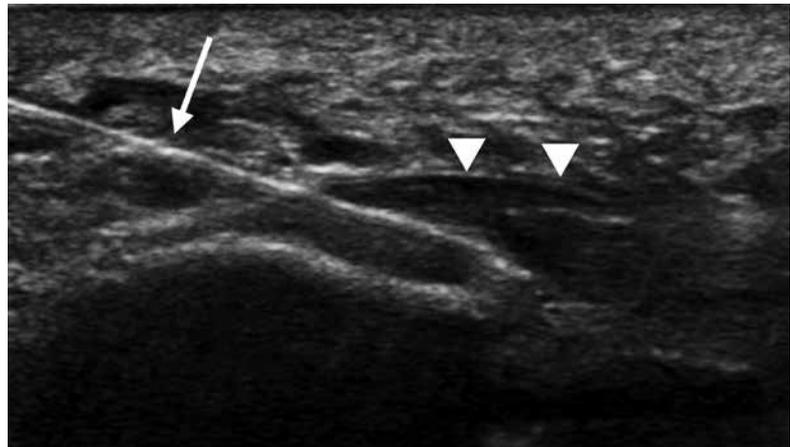
Dr. Lee said the grant helped him to build a research team that is now developing a platform in quantitative imaging of tendons and tendon regenerative research. Investigators are seeking answers to tough questions about why tendon overuse injuries occur, how disease severity can be stratified through quantitative imaging,

and how tendon disease can be effectively treated minimally invasively without surgery. The team is also investigating other common overuse injuries such as tennis elbow, jumper’s knee and Achilles injuries.

In May 2016, Dr. Lee and colleagues were awarded a three-year grant from the National Basketball Association and General Electric (GE) to investigate patellar tendinopathy (jumper’s knee) in elite athletes in the study, “Platelet-Rich Plasma Therapy for Patellar Tendinopathy: A Randomized Controlled Trial Correlating Clinical, Biomechanical and Novel Imaging Biomarkers.”

“We are really excited to leverage our experience from our RSNA-funded research to study a similar disease-tendon pathology in basketball and volleyball players,” Dr. Lee said.

Dr. Lee’s research demonstrated the effectiveness of platelet-rich plasma injections in treating plantar fasciitis. Right: A 53-year-old woman with refractory plantar fasciitis (arrowheads). Longitudinal ultrasound image showing in-plane needle placement (arrow) into the plantar fascia during the platelet-rich plasma injection.



INNOVATE

GRANTS IN ACTION

NAME:

Kenneth S. Lee, MD

GRANTS RECEIVED:

2010 Toshiba America Medical Systems/RSNA Research Seed Grant

Acoustoelastography as an Outcome Measure for Platelet-rich Plasma Injection Treatment of Chronic Plantar Fasciitis: A Pilot Study.

2013-2015 RSNA Research Scholar Grant

Quantitative Imaging of the Tendon: Use of Ultrasound Shear Wave Elastography as a Biomarker to Predict Tendon Rupture.

CAREER IMPACT:

“The RSNA has been the platform from which I was able to establish my research team, ultrasound lab and academic base. Together with a great team and supportive leadership at the University of Wisconsin, I have been able to produce impactful research in the areas of musculoskeletal tendon regeneration and biomechanics,” Dr. Lee said.

CLINICAL IMPLICATION:

Platelet-rich plasma injection treatment is more effective than steroid injection for the long-term treatment of refractory chronic plantar fasciitis, according to Dr. Lee’s research results.

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Improving Diagnosis, Staging and Treatment of Eye Disease

Eye diseases such as macular degeneration and diabetic retinopathy are significant causes of morbidity in the U.S. and are typically examined by visible light techniques with high anatomical detail.

Siemens Healthineers/RSNA Research Fellow Grant recipient **Jamal J. Derakhshan, MD, PhD**, of the University of Pennsylvania, will investigate and develop the ability to add new physiological information using diffusion-weighted imaging (DWI)-thermometry to make non-invasive temperature measurements in the eyes.

“The specific aims of this grant are critical technical development to extending DWI-thermometry by using both existing DWI techniques and newer techniques free of geometrical distortions, which may allow for 3-D mapping of ocular temperature along the retina,” Dr. Derakhshan said. “Together, these hold great potential for improving diagnosis and treatment of prevalent high-morbidity diseases and would possibly open a new avenue of research into ocular disease, as well as providing a new noninvasive diagnostic and treatment monitoring tool.”

Dr. Derakhshan gratefully acknowledges Felix W. Wehrli, PhD, for collaborating on the project as the scientific advisor, as well as the Laboratory for Structural, Physiological and Functional Imaging at the University of Pennsylvania.



Jamal J. Derakhshan, MD, PhD, with co-investigator and past R&E grant recipient Laurie A. Loevner, MD.

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 Martha & Steven M. Urman, MD, PhD
 Robert W. van Hamersvelt, MD
 Bonny Varghese, MD
 Jonas A. Vargmyr, BA
 Naveen Vasireddy, MBBS, FRCR
 William L. Walls, MD
 Tao Wang
 Lewis L. Ware Jr., MD
 Wade H. Warner
 Takeyuki Watadani, MD
 Martin J. Willemink, MD
 Albert Xthona
 Jiayuan Xu



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Continued from page 12

RSNA Visiting Professors Leave Impact on Ghana, Mexico, Mongolia, Philippines

— established in 1994 — are young and eager to learn.

“We tried to fill in some of the gaps by optimizing their MR protocols and providing teaching sessions to the residents and sharing our expertise with the radiology staff,” Dr. Torres said. “It was a beautiful experience that had a significant impact on their society.”

“I think the trip was quite successful,” Dr. McCloud said. “Mongolian radiology needs more subspecialty expertise and a major change in its residency and improvements in infrastructure and equipment. I think our advice and expertise were very useful.”

Dr. Roberts said conditions were similar in Ghana: private sector hospitals were fully equipped while public institutions relied mainly on ultrasound.

“In the public hospitals, CT scanners didn’t work because the power goes on and off randomly and it fries the electronics,” she said. “There were no surge protectors or maintenance agreements.”

Despite difficult conditions, the visiting professors had praise for the practicing radiologists and the trainees they met.

“The residents were amazing,” said Dr. Roberts, who was able to demonstrate catheterization on a 3-D model of a vascular system made by a U.S. radiology resident. “Education is limited so students learn from senior residents and put a lot of time and effort into the process. Residents use the internet a lot for learning and the RSNA website is very popular.”

Soaking Up the Local Color

Between lecturing at national conferences and spending time with trainees during hospital visits, the visiting professors put in long days while abroad.

Nevertheless, time for cultural immersion and exploring the host countries is built into each IVP trip. For Dr. Torres and colleagues, that meant traveling the grasslands where Genghis Khan once ruled, trekking to monasteries and riding a two-hump camel.

“It was a unique experience,” Dr. Torres said. “A great combination of culture, academics and history.”

Dr. Angtuaco and fellow travelers spent time island hopping, dining on Lapu-Lapu, a local fish named for a local chief who defeated the Spanish, and joining performers in a native dance.

“We’ve invested a lot of resources in education and it resonates with these countries.”

Agfa Healthcare and Fujifilm Medical Systems are supporters of the RSNA IVP program.



Philippines



Mexico



Ghana



Mongolia

Journal Highlights

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

Dual Energy CT for the Musculoskeletal System

In recent times, a diverse and exciting plethora of applications for dual energy CT (DECT) have been discovered and are now being implemented into clinical practice. These include advances in thoracic, abdominal, musculoskeletal, vascular and neurologic imaging.

The ability of DECT to provide additional information regarding tissue

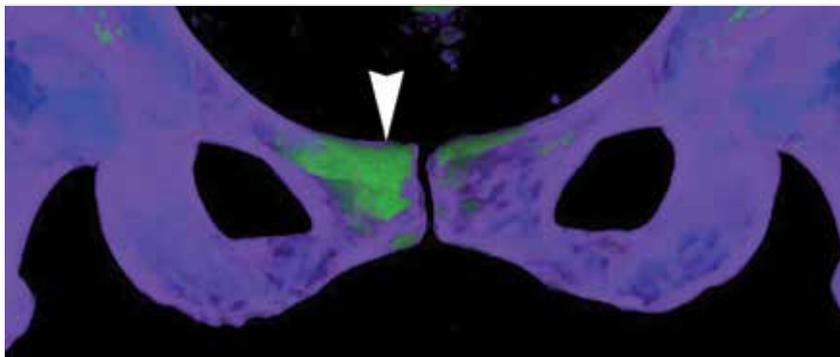
composition, artifact reduction and image optimization offers powerful advantages over conventional CT.

In the December issue of *Radiology* (RSNA.org/Radiology), Paul I. Malinson, MBChB, of the University of British Columbia in Vancouver, B.C., and colleagues discuss and summarize the application

of DECT to musculoskeletal imaging, including basic principles of DECT physics and scanner design, current clinical applications and areas of potential development.

"As technology, particularly post-processing techniques, advances, DECT may offer a more rapid and readily available problem-solving tool for cases which would normally require MR imaging, or be beyond the current scope of medical imaging," the authors write.

Radiology



When a 78-year-old woman sustained a fall at home, conventional CT was performed to rule out occult fracture after a normal radiograph. A minor cortical breach was suspected on conventional CT images, but was difficult to confirm due to osteopenia. The 3-D dual-energy CT images supported the diagnosis by confirming the presence of bone edema (arrowhead), color-coded green.

(*Radiology* 2016;281;3:690-707) ©RSNA 2016. All rights reserved. Printed with permission.

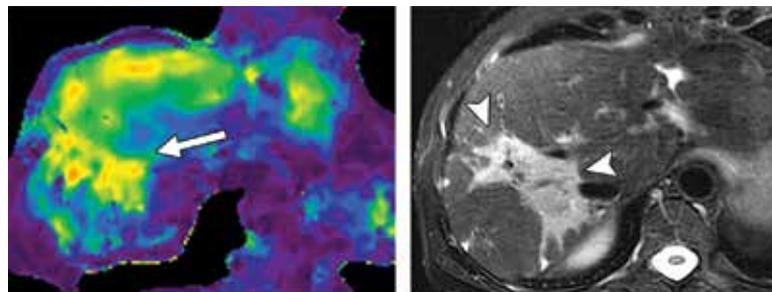
This article meets the criteria for *AMA PRA Category 1 Credit™*. SA-CME is available online only.

Elastography in Chronic Liver Disease: Modalities, Techniques, Limitations, and Future Directions

Accurate staging of the degree of fibrosis is essential in the management and determination of the prognosis of patients with chronic liver disease. Although liver biopsy is considered to be the reference standard for assessment of fibrosis, biopsy has several limitations, including its invasive nature, inability to assess the degree of fibrosis throughout the liver, sampling error, and incidence of complications.

In the December issue of *RadioGraphics* (RSNA.org/RadioGraphics), Aparna Srinivasa Babu, MD, from Mercy Catholic Medical Center in Darby, Penn., and colleagues provide a brief overview of chronic liver disease and the tools used for its diagnosis. Ultrasound (US) elastography and MR elastography are explored in depth, including a brief glimpse into the evolution of elastography.

Elastography is based on the principle of measuring tissue response to a known mechanical stimulus. Specific elastographic techniques used to exploit this principle include MR elastography



Autoimmune hepatitis in a 64-year-old woman. (e) MR elastogram shows diffusely abnormal liver stiffness, with focally increased stiffness in the right hepatic lobe (arrow). (f) Corresponding axial T2-weighted MR anatomic image shows that the focal stiffness corresponds to a region of confluent fibrosis (arrowheads).

(*RadioGraphics* 2016;36;7:1987-2009) ©RSNA 2016 All rights reserved. Printed with permission.

and US-based static or quasistatic strain imaging, one-dimensional transient elastography, point shear-wave elastography, and supersonic shear-wave elastography. The advantages, limitations, and pitfalls of each modality are emphasized.

"US elastography and MR elastography have emerged as the modalities of choice for quantifying hepatic fibrosis, proving to be superior to conventional

cross-sectional imaging, especially in the precirrhotic stages," the authors write.

This article is accompanied by an Invited Commentary by Richard G. Barr, MD, PhD, from the Northeast Ohio Medical University in Youngstown, Ohio.

RadioGraphics

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



Radiology EXTRA
PODCASTS

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

- “Meta-Analyses of Diagnostic Accuracy in Imaging Journals: Analysis of Pooling Techniques and Their Effect on Summary Estimates of Diagnostic Accuracy,” Trevor A. McGrath, BSc, and colleagues.
- “Postoperative versus Spontaneous Intracranial Abscess: Diagnostic Value of the Apparent Diffusion Coefficient for Accurate Assessment,” Eyal Lotan, MD, MSc, and colleagues.
- “Early-Stage Non–Small Cell Lung Cancer: Quantitative Imaging Characteristics of 18F Fluorodeoxyglucose PET/CT Allow Prediction of Distant Metastasis,” Jia Wu, PhD, and colleagues.

Radiology in Public Focus

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

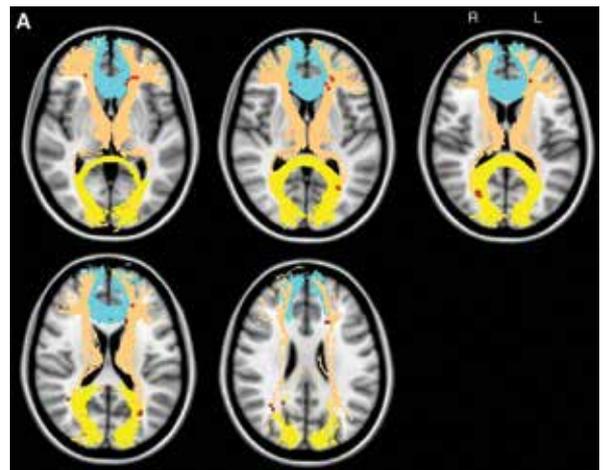
‘Traffic Jam’ in Brain Linked to Common Cognitive Disorder

Subcortical white matter ischemic lesion locations and severity of ultrastructural tract damage contribute to cognitive impairment in symptomatic Carotid Artery Disease (CAD), which suggests that subcortical disconnection within large-scale cognitive neural networks is a key mechanism of vascular cognitive disorder, according to new research.

In a study of 108 patients with symptomatic CAD but no dementia, Dewen Meng, MSc, of the University of Nottingham, England, and colleagues conducted comparisons and interrelations between global cognitive and fluency performance, lesion topography and ultrastructural damage, assessed with voxel-based statistics. Associations between cognition, medial temporal lobe atrophy lesion volumes, and global white matter ultrastructural damage indexed as increased mean diffusivity were tested with regression analysis by controlling for age.

In patients with CAD, researchers determined that cerebrovascular lesion location in the thalamic radiation and interhemispheric fiber tracts contributes to global cognitive deficits and lesions in the thalamic radiation and long association fibers affect fluency performance. Severity of subcortical tissue damage — preferentially in major white matter tracts — contributes to global cognitive impairment with skeleton mean diffusivity as the best-performing imaging marker for the prediction of probable vascular cognitive disorder, researchers determined.

“The findings provide insights into how cerebrovascular disease contributes to cognitive impairment and/or dementia and highlight the need to combat progressive subcortical brain tissue damage; average white matter skeleton mean diffusivity shows potential as a simple diagnostic marker of subcortical disconnection underlying vascular cognitive disorder,” the authors write.



Maps show the topography of chronic ischemic lesions associated with global cognitive impairment. Significant clusters (red) according to VLSM analysis ($P < .05$, false discovery rate corrected, controlled for age and normalized total ischemic lesion volumes after logarithmic transformation) are projected onto the MNI152 standard-space T1-weighted average structural template image with overlain selected WMTs from the Johns Hopkins University DTI-based white matter atlas (yellow, forceps major; brown, anterior thalamic radiation; blue, forceps minor).

(*Radiology* 2017;282:2:InPress) ©RSNA 2016. All rights reserved. Printed with permission).

December Public Information Activities Focus on Zika Virus

In December, RSNA’s 60-Second Checkup radio program will focus on the use of medical imaging to diagnose brain abnormalities from congenital Zika infection.

Brain Changes Seen in Youth Football Players without Concussion

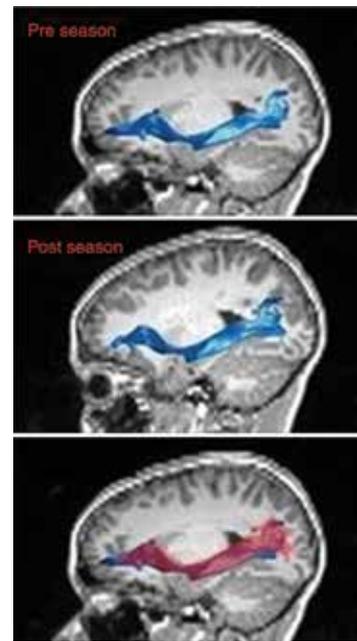
An increase in subconcussive head impact exposure may have an effect on white matter (WM) integrity in youth athletes, even in the absence of a clinically diagnosed concussion, according to new Radiology research.

Naeim Bahrami, PhD, from the Advanced Neuroscience Imaging Research (ANSIR) Laboratory in Winston-Salem, N.C., and colleagues found a statistically significant relationship between combined-probability risk-weighted cumulative exposure (RWECP) and change of fractional anisotropy (FA) in the left inferior fronto-occipital fasciculus (IFOF).

In a study of 25 male participants (age range 8 to 13 years) from a local youth

football league, researchers used the Head Impact Telemetry system to record head impact data and quantify the RWECP. There were statistically significant linear relationships between RWECP and decreased FA in the whole, core and terminals of left IFOF. A trend toward statistical significance in right superior longitudinal fasciculus (SLF) was observed. A statistically significant correlation between decrease in FA of the right SLF terminal and RWECP was also observed.

“The results of this study suggest that subconcussive impacts can result in changes in the WM microstructure of the IFOF and SLF fiber bundles,” the authors write.



MR images of left IFOF (top) before and (middle) after the playing season, and (bottom) the overlay. In the overlay (bottom), after the season is shown in red and before the season is shown in blue.

(Radiology 2016;281:3:919-926) ©RSNA 2016. All rights reserved. Printed with permission).

Healthcare Reforms Spur Increase in Screening Mammography

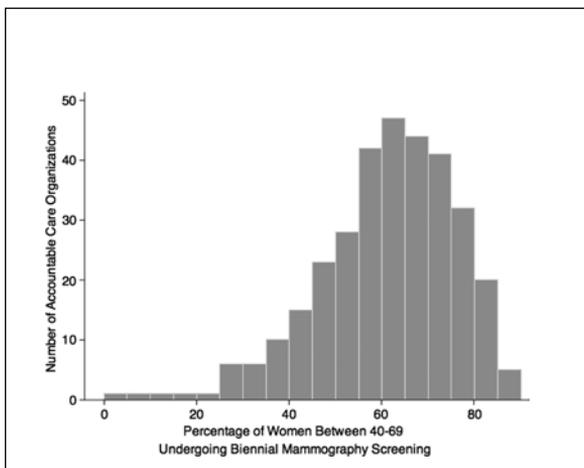
Accountable Care Organizations (ACOs) in the Medicare Shared Savings Program (MSSP) have produced small but significant improvements in screening mammography

use, according to new research. Established as part of the Affordable Care Act, MSSP is the largest value-based reimbursement program in U.S. history.

Researchers Anand K. Narayan, MD, PhD, Susan C. Harvey, MD, and Daniel J. Durand, MD, of Johns Hopkins Hospital in Baltimore, retrospectively reviewed 333 ACOs with more than five million Medicare beneficiaries from 2012 to 2014.

ACOs participating in the MSSP demonstrated a mean increase of 2.6 percent in use of screening mammography, with 61.6 percent of ACOs reporting improvements, according to results. Their findings are in contrast to results of prior reports on traditional fee-for-service populations in which screening mammography use was unchanged or declined over the same time.

“As reimbursements transition from fee-for-service to population-based models, it will become increasingly important for radiologists to work actively with other stakeholders to determine and develop effective strategies to improve population-based health care,” the authors write.



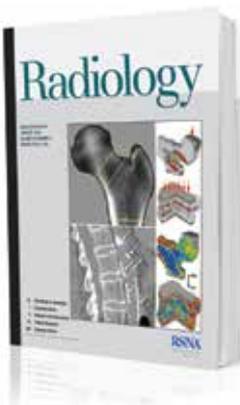
Histogram shows screening mammography use in 333 Accountable Care Organization in 2014.

(Radiology 2017;InPress. ©RSNA 2016. All rights reserved. Printed with permission).

Media Coverage of RSNA

In August, 1,206 RSNA-related news stories were tracked in the media. These stories reached an estimated 2.2 billion people.

Coverage included *The New York Times*, *The Huffington Post*, *NBC Nightly News*, *ABC World News Tonight*, *NPR*, *Voice of America*, *Yahoo! News*, *U.S. News & World Report*, *HLN*, *Fox News Channel*, *CNN*, *WCBS-TV (New York)*, *WNBC-TV (New York)*, *WABC-TV (New York)*, *KNBC-TV (Los Angeles)*, *KTLA-TV (Los Angeles)*, *WMAQ-TV (Chicago)*, *WGN America*, *The Washington Post*, *Newsday*, *The Boston Globe*, *TIME*, *Self*, *National Post*, *Toronto Star*, *The Denver Post*, *The Globe and Mail*, *Philly.com* and *HealthDay*.



RSNA Wins Three 2016 MarCom Awards

RSNA received three 2016 MarCom Awards from the Association of Marketing & Communication Professionals, a prestigious international awards competition that recognizes outstanding creative achievement. RSNA received a Platinum Award, the top honor, for an Aug. 23 front-page article in the New York Times, “Scans of Brains Show an Array of Zika Effects,” based on Radiology research on the Zika virus.

Gold Awards were given for the RSNA 2015 Press Kit welcoming world press to the RSNA 2015 Annual Meeting and for website redesign of *RadiologyInfo.org*, the RSNA-ACR public information website designed specifically for patients.

Winners were selected from more than 6,000 entries from throughout the world. Entries come from corporate marketing and communication departments, advertising agencies, PR firms, design shops, production companies and freelancers.

The MarCom Awards competition is administered and judged by the Association of Marketing and Communication Professionals, an international organization consisting of several thousand creative professionals.



WEB EXTRAS

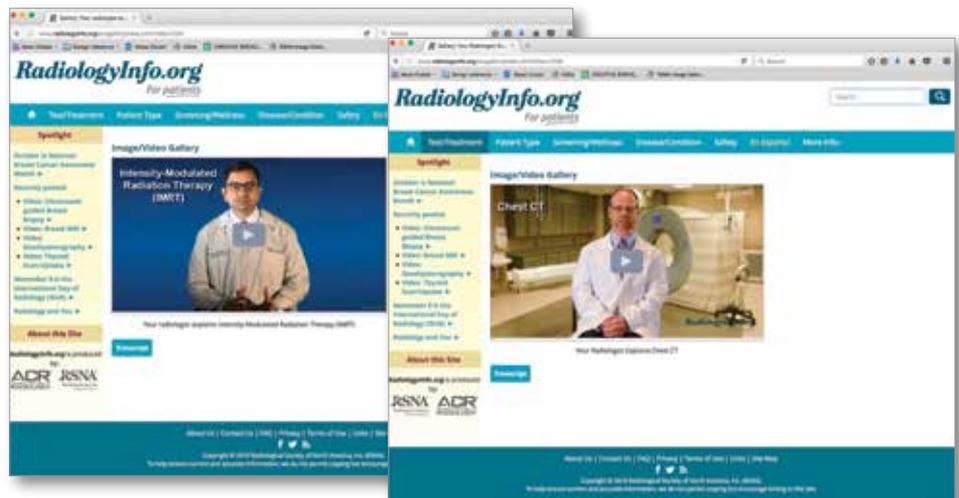
- ☑ View the redesign at RadiologyInfo.org
- ☑ Access the *New York Times* article based on the *Radiology* Zika research at www.nytimes.com
- ☑ For more information on MarCom, go to MarcomAwards.com

New Videos on *RadiologyInfo.org*

Visit *RadiologyInfo.org*, the public information website produced by the RSNA and ACR, to view the newest “Your Radiologist Explains” videos, including:

- Catheter Angiography
- Chest MRI
- Chest CT
- Prostate Ultrasound
- IMRT

RadiologyInfo.org
For patients



Annual Meeting Watch

RSNA 2017 Online Abstract Submission Opens mid-January

The online system to submit abstracts for RSNA 2017 will be activated in mid-January. The submission deadline is noon Central Time (CT) on Wednesday, April 12, 2017. Abstracts are required for scientific presentations, education exhibits, applied science, quality storyboards and quantitative imaging reading room show-cases.

To submit an abstract online, go to RSNA.org/Abstracts. The easy-to-use online system helps the Scientific Program Committee and Education Exhibits Committee evaluate submissions efficiently. For more information about abstract submissions, contact the RSNA Program Services Department at 1-877-776-2227 within the U.S., or 1-630-590-7774 outside the U.S.

The top neuroradiology scientific paper as selected by the Scientific Program Committee will receive a \$3,000 award at RSNA 2017.

Students, clinical trainees and post-doctoral trainees are eligible to receive \$500 travel awards for top-rated abstracts accepted for presentation at RSNA 2017. Trainees are also eligible to receive a \$1,000 research prize.

Full eligibility requirements for all awards will be available with the 2017 Call for Abstracts in mid-January.

SHARE YOUR KNOWLEDGE AND BE SEEN

Present at RSNA 2017:

- Scientific Presentations
- Applied Science
- Education Exhibits
- Quality Storyboards
- Quantitative Imaging Reading Room

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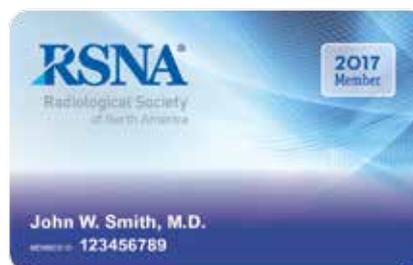
November 26 – December 1
103rd Scientific Assembly & Annual Meeting

Value of Membership

Have You Renewed Your RSNA Membership?

RSNA Membership renewal for 2017 is currently underway. Renew online at RSNA.org/Renew or by mail with the invoice sent in early October.

Renewing members also have the option to sign up for automatic membership renewal. Dues and optional donation amounts are charged to your credit card automatically when it's time to renew. Automatic renewal ensures that your membership benefits don't lapse and reduces the impact on the environment. For questions about automatic membership renewal, please contact membership@rsna.org.



Education and Funding Opportunities

Writing a Competitive Grant Proposal Program

Registration is open for the Writing a Competitive Grant Proposal workshop, designed for researchers in radiology, radiation oncology, nuclear medicine and related sciences who are interested in actively pursuing funding from the federal government, societies or foundations.

Participants will receive tools for getting started in the grant writing process and developing realistic expectations. Faculty includes Udo Hoffmann, MD, MPH, of Massachusetts General Hospital in Boston; Ruth Carlos, MD, of the University of Michigan Health System in Ann Arbor, Mich; Martin Pomper, MD, PhD, of Johns Hopkins School of Medicine in Baltimore; David Shuster, MD, of Emory University in Atlanta; and Antonio Sastre, PhD, of the National Institute of Biomedical Imaging and Bioengineering in Bethesda, Md.

The course fee is \$225. Register online at RSNA.org/CGP. Contact Fiona Miller at dor@rsna.org or 1-630-590-7741 for more information.

March 10 – 11, 2017
RSNA Headquarters
Oak Brook, IL



Residents & Fellows Corner

RSNA News to be Delivered Digitally Starting in January

In response to the general reading and mailing preferences of RSNA members-in-training, beginning in January 2017 *RSNA News* will be distributed to training members digitally via the monthly RSNA Insider email and can be accessed anytime from *RSNA News* Digital First postings and RSNA.org/News. This change also supports the Society's ongoing efforts to be environmentally conscientious. Training members who want to receive the print version of *RSNA News* can opt in at any time to continue or begin receiving the monthly magazine in their postal mail.

To opt in to the print magazine, call 1-630-571-7873 or 877-776-2636 (toll free in the U.S.), or email membership@rsna.org and supply your eight-digit membership number from the mailing label on *RSNA News*.

As a benefit of membership, RSNA members — other than training members — automatically receive *RSNA News* in print unless they opt out. If you wish to opt out of the print mailing and receive digital *RSNA News* through the monthly RSNA Insider email, *RSNA News* Digital First postings and from RSNA.org/News:

1. Go to RSNA.org/membership
2. From the left navigation column click "My Account"
3. Log in with your username and password
4. From the Account Tools table click "Print Journal Opt-Out"
5. Select "Opt Out" to *RSNA News*

Contact membership@rsna.org with questions.

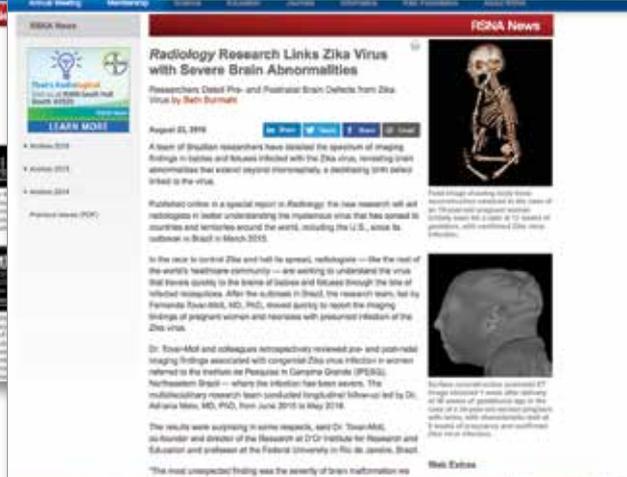
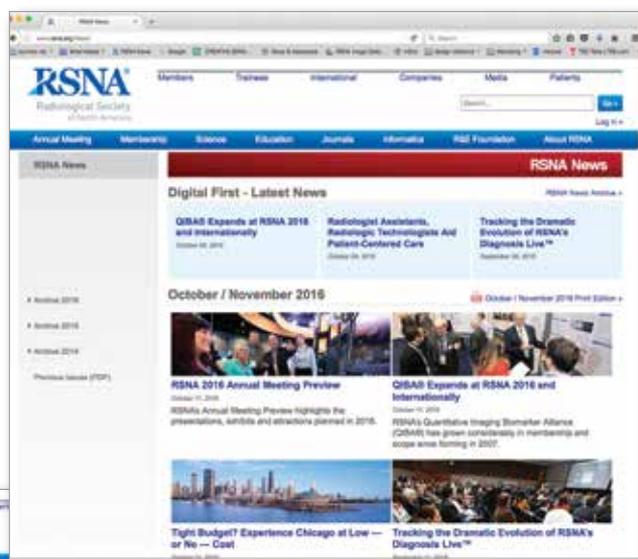
Digital First Features Radiology News As it Breaks

Readers who are familiar with *RSNA News* as a trusted source of news and information are turning to the magazine's online portal, Digital First, for news and information posted as it breaks — long before the print magazine arrives in their mailboxes.

Whether it is breaking news about an exciting new study in *Radiology* on the Zika virus, or an in-depth feature about biophotonics posted ahead of print, Digital First — located at RSNA.org/News — keeps readers up-to-date on the latest radiology news most critical to RSNA members.

Digital First is also the place for exclusive RSNA information including reports on the most recent RSNA International Visiting Professor trips, breaking *Radiology* research, member accomplishments, news from the Research & Education (R&E) Foundation and more.

Find Digital First at RSNA.org/News above the monthly online edition of the magazine and follow Digital First posts on Facebook (Facebook.com/RSNAfans) and Twitter (twitter.com/RSNA).



COMING
NEXT
MONTH

Next month, *RSNA News* will feature highlights of some of the most compelling news, images and events from RSNA 2016.

Taking prone breast biopsy to **A NEW DIMENSION**

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**FASTER AND EASIER
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Introducing the Affirm™ Prone Breast Biopsy System. A state-of-the-art solution re-engineered from the ground up, so you can target lesions with more confidence and complete patient procedures in less time.†

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Affirm™
Prone Biopsy System

*Compared to the MultiCare® Platinum system
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