



## Imaging at the Forefront of Precision Medicine

### ALSO INSIDE:

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## RSNA News™

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## RSNA MISSION

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

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# Plenary Speakers Announced for RSNA 2017

The RSNA Board of Directors has announced the plenary speakers who will present at the 103<sup>rd</sup> Scientific Assembly and Annual Meeting.

**RSNA® 2017**



**President's Address**  
**Richard L. Ehman, MD**  
 Nov. 26 at 8:30 a.m.  
 "Is it Time to Reinvent Radiology?"



**Opening Session**  
**Roderic I. Pettigrew, MD, PhD**  
 Nov. 26 at 8:30 a.m.  
 "Tomorrow's Radiology"



**Opening Session**  
**Elias A. Zerhouni, MD**  
 Nov. 26 at 8:30 a.m.  
 "Imaging Innovation in 21<sup>st</sup> Century Biomedicine: Challenges and Opportunities"



**New Horizons Lecture**  
**Daniel Sodickson, MD, PhD**  
 Nov. 27 at 1:30 p.m.  
 "A New Light: The Birth, and Rebirth, of Imaging"



**RSNA/AAPM Symposium**  
**Keith J. Dreyer, DO, PhD**  
 Nov. 28 at 10:30 a.m.  
 "Harnessing Artificial Intelligence"



**RSNA/AAPM Symposium**  
**Antonio Criminisi, PhD**  
 Nov. 28 at 10:30 a.m.  
 "Assistive AI for Cancer Treatment"



**Annual Oration in Diagnostic Radiology**  
**Jonathan B. Kruskal, MD, PhD**  
 Nov. 28 at 1:30 p.m.  
 "Strategies for Radiology to Thrive in the Value Era"



**Annual Oration in Radiation Oncology**  
**Daphne A. Haas-Kogan, MD**  
 Nov. 29 at 1:30 p.m.  
 "Personalized Medicine and Radiation Oncology"



**Plenary Lecture**  
**Robert Herjavec**  
 Co-Host of *Shark Tank*  
 Nov. 30 at 2 p.m.  
 "Fast Forward and Focused"

## ASNR Announces 2017 Awards for Zimmerman, Parizel

The American Society of Neuroradiology (ASNR) presented awards in April during its annual meeting in Long Beach, CA.

**Robert D. Zimmerman, MD**, received the society's gold medal. He is a professor of radiology and has served as residency director and/or vice chair for education at Weill Cornell Medical College in New York City for over 15 years. Dr. Zimmerman serves on the RSNA Public Information Advisors Network and has reviewed manuscripts for *RadioGraphics*. He served as ASNR president in 2008.



**Paul M. Parizel, MD, PhD**, chairman of radiology at the University of Antwerp in Belgium, received the 2017 Honorary Member Award. Dr. Parizel has served as faculty at the RSNA annual meeting and is the current chair of the Board of Directors of the European Society of Radiology.



## Vedantham is SIR President

Suresh Vedantham, MD, assumed the office of president of the Society of Interventional Radiology (SIR) during the society's Annual Scientific Meeting in Washington, D.C., in March.

Dr. Vedantham is an interventional radiologist and professor of radiology and surgery at the Mallinckrodt Institute of Radiology, Washington University in St. Louis.

Other incoming officers of SIR's 2017–18 Executive Council include President-elect **M. Victoria Marx, MD**, Los Angeles; Secretary **Laura Findeiss, MD**, Knoxville, TN; Treasurer **Matthew S. Johnson, MD**, Indianapolis; and Immediate Past President **Charles E. Ray Jr., MD, PhD**, Chicago.



Vedantham

## ARRT Announces New Pathway to RRA Credential

The American Registry of Radiologic Technologists (ARRT) has expanded its eligibility requirements to establish a temporary pathway for Radiology Practitioner Assistants (RPA) who want to earn ARRT's Registered Radiologist Assistant (RRA) credential.

The RPA eligibility pathway to RRA certification and registration is available to those who have earned and currently hold certification through the Certification Board for Radiology Practitioner Assistants. Candidates have until Dec. 31, 2020, to complete the requirements, including passing the ARRT examination. For complete requirements and to apply, visit [ARRT.org](http://ARRT.org).

## In Memoriam

### University of North Carolina Mourning Two Esteemed Radiologists

#### Robert McLelland II, MD

An expert in breast imaging, Robert McLelland II, MD, died March 3 in Durham, NC. He was 95.

A native of Toronto, Ontario, Dr. McLelland was inspired to pursue medicine by a beloved professor he met when he joined the Navy V-12 program in 1942 and was sent to the Illinois Institute of Technology. After serving two years of active duty during the Korean War, he earned his medical degree at the University of Cincinnati School of Medicine and completed a residency and fellowship at Philadelphia General Hospital.

After several years in private practice in Virginia, Dr. McLelland joined the faculty in the Department of Radiology at the Duke University School of Medicine, Durham, NC, in 1968. He served as principal investigator of the Breast Cancer Detection Demonstration Project sponsored by the National Cancer Institute and the American Cancer Society. He developed and directed the first radiology postgraduate education programs offered in Virginia and North Carolina.

Dr. McLelland joined the faculty of the School of Medicine at the University of North Carolina at Chapel Hill in 1981 where he remained until his retirement in 2005. He was a Fellow Emeritus of the American College of Radiology and Society of Breast Imaging. Dr. McLelland served as an examiner for the American Board of Radiology. An RSNA member since 1956, Dr. McLelland also served on the RSNA Refresher Course Committee.



McLelland

#### James H. Scatliff, MD

Renowned educator James H. Scatliff, MD, died March 4 in Chapel Hill, NC. He was 89.

Dr. Scatliff was the chairman emeritus of the Department of Radiology at the University of North Carolina (UNC) School of Medicine, Chapel Hill. He became the chair of the Department of Radiology at UNC-Chapel Hill in 1966 where he continued to teach until his death.

Over the span of his 65-year career, Dr. Scatliff made significant contributions to expanding the field of radiology as a researcher, mentor and teacher. A past president of the Association of University Radiologists (AUR), Dr. Scatliff received the AUR gold medal in 1998.

Born in Evanston, IL, Dr. Scatliff served in the U.S. Army as a medical corpsman in Korea before graduating in 1952 from Northwestern University Medical School, Chicago. After completing his internship and radiology residency at Michael Reese Hospital in Chicago, he accepted a fellowship in neuroradiology at St. George's Hospital in London.

Dr. Scatliff spent the first 10 years of his career as an academic radiologist at Yale University Medical Center before moving to UNC. In 1992, UNC honored his achievement by establishing the Scatliff MRI Center. Dr. Scatliff was further honored with three UNC Professor of the Year awards, the UNC Distinguished Faculty Award and the Hyman L. Battle Distinguished Excellence in Teaching Award. Northwestern University's Feinberg School of Medicine recognized his accomplishments with the Distinguished Alumnus Award.



Scatliff

# RSNA Board of Directors Report

The RSNA Board of Directors met in January and March to plan for RSNA 2017 and update the 2017–2022 strategic plan.

## International Collaboration

RSNA will conduct a joint symposium on head and neck imaging with the Asian Oceanian Society of Radiology in conjunction with the 2018 Asian Oceanian Congress of Radiology and RSNA 2018.

The Board also approved an annual international travel award for up to 50 qualifying individuals from low-resource countries. The \$500 award is intended to defray travel expenses to the RSNA annual meeting, beginning in 2018.

## Embracing Machine Learning

In recognition of the growth of interest in machine learning (ML) applications for radiology, the Board updated the Society's strategic plan to include a strategy to develop initiatives addressing the relevance of ML in radiology. Additionally, the topic was approved as the focus of the RSNA/AAPM Symposium, "Machine Learning in Radiology: Why and How?" at RSNA 2017.

## 3-D Printing Special Interest Group

The 3-D Printing Special Interest Group (SIG) has grown to include 110 members since its November 2016 launch. The SIG met in March to begin planning activities including education and



Jackson

developing consensus guidelines for 3-D printing from medical images. Current RSNA members can join the SIG for a \$40 annual fee by contacting the RSNA Membership Department.

## Educational Webinars

The Board approved the launch of educational webinars in

2018, with live lectures and interactive question-and-answer sessions.

## RSNA 2017 Planning Underway

The Board approved plenary speakers for the annual meeting (see page 2) and selected topics for Special Interest and Hot Topics sessions. Special Interest topics will include dementia, the radiology experience from the patient's perspective, translating quantitative imaging research to clinical practice, radiofrequency ablation in combination with immunotherapy, and the use of contrast-enhanced ultrasound. Gold Medal and Honorary Membership recipients were also determined.

The NCI Perception Lab will continue its research in the Learning Center at RSNA 2017. Additionally, the NCI's Cancer Imaging Archive will conduct a new image annotation crowdsourcing activity at the annual meeting.

In an ongoing effort to provide the highest quality content at a good value,

the Board established new Premium and Executive registration packages, enabling attendees to customize their experiences (see page 24). Additionally, the RSNA 2017 Virtual Meeting will be expanded to include approximately 150 sessions, or 25 percent of the annual meeting content. The Virtual Meeting will be available on demand through Feb. 2018.

## Expanded Membership Categories

The Board moved to expand RSNA membership eligibility criteria by adding a Patient Advocate subcategory of Associate member, and proposing that the RSNA bylaws be amended to add membership categories for medical students outside of North America, and graduate students, both North American and non-North American.

## Thank You

I greatly appreciate the thoughtful work of the RSNA board members, staff and volunteers who are continually evaluating and enhancing RSNA's programs to bring innovation and value to our members and meeting attendees. The ultimate beneficiaries of RSNA's education and research programs are our patients.

**Valerie P. Jackson, MD**

*Chair*

RSNA Board of Directors

## Numbers in the News

# 70

Number — in millions — of federal dollars allocated to the National Cancer Institute under the federal Precision Medicine Initiative. Read about the critical role of imaging in precision medicine on [Page 8](#).

# 10–20

The percentage of time a subspecialist second-opinion read will result in actionable change, according to new research. Read more on [Page 11](#).

# 11,000

Number of international visitors who attended RSNA 2016. Information for RSNA 2017 international travelers is available on [Page 25](#).

### RSNA NEWS

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# LOOK AHEAD

## *Imaging's Critical Role in the Cancer Moonshot Initiative*

BY C. CARL JAFFE, MD

Capitalizing on rapid substantial advances in molecular cellular knowledge and empowered by new technologies developed during the Human Genome Initiative (1990–2001) and the National Cancer Institute's (NCI) subsequent The Cancer Genome Atlas (2004–2012), the cancer scientific community has been emboldened to declare that a cancer knowledge tipping point is in the offing.

This development encouraged an ambitious federal executive branch announcement in 2016 known as the "Cancer Moonshot," an initiative led by former Vice President Joe Biden. The original funding initiative stands to be further buttressed by the 21<sup>st</sup> Century Cures Act. Moving quickly, the NIH formed a visionary Blue Ribbon Panel (BRP) to define achievable goals that could shorten the timeframe of cancer knowledge progress by half — from 10 years to five. Those goals carry exciting potential for the imaging community (see sidebar).

### **The APOLLO Consortium**

One of the earliest-defined Moonshot goals that specifically incorporates imaging is the Applied Proteogenomics Organizational Learning and Outcomes (APOLLO) consortium. (read more in the Precision Medicine article on page 8). The departments of Defense (DOD), Veterans Affairs (VA) and NCI have formed a collaboration using state-of-the-art research methods in proteogenomics to more rapidly identify unique targets and pathways for cancer detection and intervention. These methods look for a patient's genes that may lead to cancer and the expression of these genes in the form of proteins, all of which have potential impact on understanding disease formation and treatment. The full set of medical images, including CT and MRI scans, obtained for each patient before and during treatment will be acquired and curated in NCI's open-access The Cancer Imaging Archive (TCIA) (see sidebar, Page 7).

Each individual set of images will be connected to that patient's clinical, genomic and proteomic data. Big data science techniques can then be applied to understand the relationships amongst these disparate data. Assembling all the data available (analytical, invasive, noninvasive and clinical) may enable researchers to develop predictive and prognostic models to improve patient care. The initial collaborative effort focuses on a cohort of 8,000 patients with lung cancer from the nation's two largest healthcare systems (VA and DOD) but later will include other tumor types. To broaden the program's reach, the U.S. has signed memoranda of understanding (MOUs) with eight countries since July 2016 to facilitate collaborations.



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### **C. CARL JAFFE, MD**

Dr. Jaffe is a professor of radiology, Boston University School of Medicine, and Professor Emeritus of Medicine (Cardiology), Yale University School of Medicine. He is currently the consultant to the National Cancer Institute's (NCI) Cancer Imaging Program and previously led The Cancer Imaging Archive (TCIA) initiative which de-identifies and hosts a large, publicly accessible archive of medical cancer images. Dr. Jaffe served as second vice president of RSNA from 1999-2000 and presented the New Horizons Lecture at RSNA 1998.

### Imaging is Key to Goals of Blue Ribbon Panel

One BRP goal is to create a national ecosystem for sharing and analyzing cancer data, enabling researchers, clinicians and patients to contribute data that will facilitate efficient data analysis. Concrete steps in that direction have already shown progress. A critical cornerstone resource is the rapidly evolving NCI Genetic Data Commons (GDC) database. As that comprehensive database continues to evolve it will contain internet searchable large-scale genetic, proteomic and clinical outcome data from individual patients linkable to their clinical images in a protected health information (PHI)-compliant but publicly accessible way.

The NCI's publicly accessible TCIA has already been operational for the past half-decade. TCIA and similar resources needed by the cross-disciplinary scientific community will

likely grow more invaluable to the imaging research community as GDC-TCIA database linkages develop. One of the most common concerns cited as a major impediment to clinical image sharing — PHI leaks in the DICOM headers — has largely been put to rest by TCIA's time-proven, multi-stage curation process originally based on RSNA's Clinical Trial Processor (CTP). The software was developed as part of the RSNA-sponsored open source Medical Image Resource Community (MIRC). The national ecosystem will focus on research and discovery. In the future, it is expected that the resulting tools, methods and multi-domain signatures will be integrated into clinically-useful imaging workflows and artificial intelligence systems that will meaningfully improve the overall standard of care in cancer.

### NCI-MATCH CLINICAL TRIAL

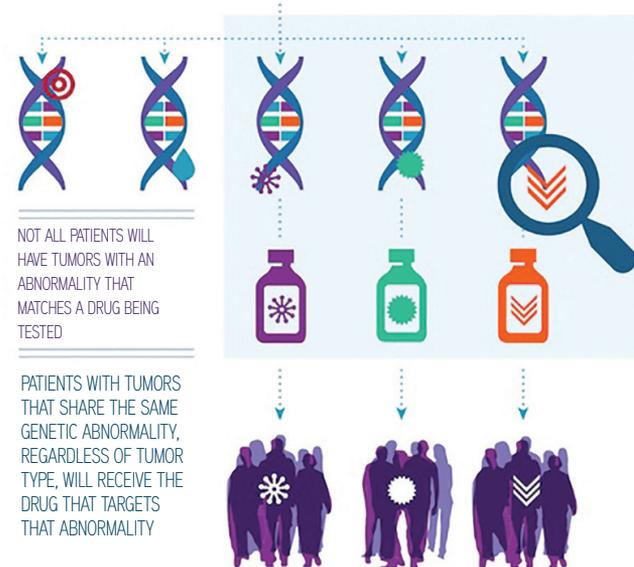
THIS PRECISION MEDICINE TRIAL EXPLORES TREATING PATIENTS BASED ON THE MOLECULAR PROFILES OF THEIR TUMORS

NCI-MATCH® IS FOR ADULTS WITH:

- solid tumors (including rare tumors), lymphomas, and myeloma
- tumors that no longer respond to standard treatment



IF A PATIENT'S TUMOR HAS A GENETIC ABNORMALITY THAT MATCHES ONE TARGETED BY A DRUG USED IN THE TRIAL, THE PATIENT WILL BE ELIGIBLE TO JOIN THE TREATMENT PORTION OF NCI-MATCH



**The NCI-MATCH Clinical Trial seeks to determine whether treating cancers according to their molecular abnormalities will show evidence of effectiveness. Images (above and right) courtesy of NCI/National Human Genome Research Institute**

### Developing Personalized Cancer Care

The panel also calls for developing new cancer technologies to characterize tumors and test therapies. The imaging community has made progress by developing quantitatively reproducible radiomic and radiogenomic analytic processes championed by a host of cross-disciplinary radiologist-computer scientist teams. These advances are now making their way into accepted practice within both researcher and clinician imaging communities. The refinement of these technologies will accelerate the transition of tumor volumetrics to replace legacy techniques such as Response Evaluation Criteria in Solid Tumors (RECIST) with more sophisticated imaging signal processing so they can become an essential part of the practice of precision medicine. Instead of being used primarily in clinical imaging trials, the availability of these tools will mean that variations in patients' responses will be registered and more accurately tracked through imaging as drivers of standard of care therapy. In addition to immediate improvements in care, these quantifiable results can be fed back into research as a resource to further refine such tools and methods.

Another goal of the BRP is to establish time-sequential 3-D maps of patient-specific tumors that arise from their genetic abnormality and their response to molecularly selected precision therapies. This focus will open new understanding of why some histologically similar cancers respond while others are resistant. Active imaging and computer science teams are demonstrating the value of extracting non-humanly visible texture, shape and boundary properties too subtle to be recognized visually. The mapping of molecular pathways will scale upward to phenotypic properties, and imaging thus will help align these links to tumor phenotypic expression. The growth of cancers from precancerous lesions to advanced metastatic cancer is frequently a growth in volume, which is monitored and measured in large part by conventional clinical imaging.

Finally, the BRP intends to establish a cancer immunotherapy network to discover why immunotherapy is so effective in some patients but not in others. This particular goal calls for some relevant background. In the 1990s the U.S. Food and Drug Administration (FDA) began to incorporate accelerated approval (AA) as an acceptable drug therapy pathway for approval based on promising tumor objective response revealed in Phase II clinical trials. Though there is an FDA expectation that the pharmaceutical company applicant would still conduct

much larger Phase III trials, this flexibility encouraged the pharmaceutical industry as a way to significantly shorten time to market. Imaging's role in this clinical trial AA framework is critical. Evidence for the importance of imaging as pivotal data in Phase II trials is shown by its now frequent use for defining a solid tumor's response. This has become especially important for testing immunologically based therapies by the metric known as progression-free survival (PFS). One recent example of PFS's critical role is evident in the FDA's favorable review of pembrolizumab for non-small cell lung cancer. This raises the question of how the usual evidence for PFS is established — i.e., it is done by imaging where a non-invasive time sequential measurement of tumor volume is already an accepted methodology.

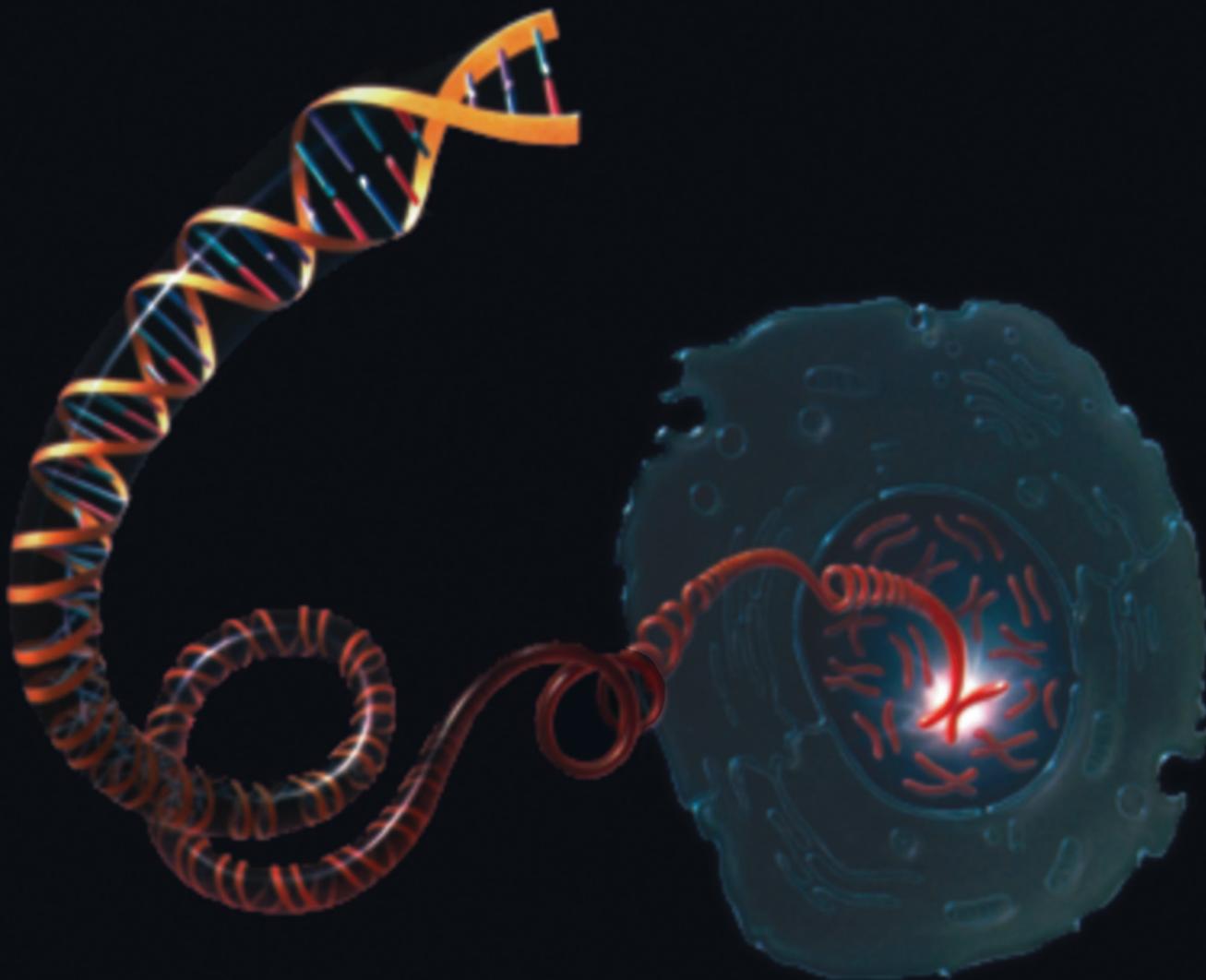
The Moonshot has created extensive NIH funding opportunities for the imaging research community (see sidebar below). The Moonshot and APOLLO announcements, accompanied by new research funding opportunities integrated by cross-disciplinary researchers will inevitably advance the march toward precision medicine. Patient imaging, generated by clinical trial researchers and during routine standard of care, will become more widely recognized as essential to validating new therapeutic agents and strategies based on rapid advances in cellular molecular knowledge. **R**

*Author disclaimer: Content of this article is solely the opinion of the author and is not to be construed as that of the NCI, National Institutes of Health or Health and Human Services.*

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## Access Cancer Imaging Resources

- For information on the Cancer Moonshot Initiative and APOLLO, including funding opportunities for the imaging research community, and the goals of the NIH Blue Ribbon Panel, go to [www.cancer.gov](http://www.cancer.gov).
- For more information on Cancer Imaging Program FOAs and The Cancer Imaging Archive, go to [www.cancerimagingarchive.net](http://www.cancerimagingarchive.net).
- For information on the Genetic Data Commons, go to [portal.gdc.cancer.gov](http://portal.gdc.cancer.gov).



# Imaging at the Forefront of Precision Medicine

BY MIKE BASSETT

Two years after former President Obama launched the \$215 million Precision Medicine Initiative, the movement continues to evolve at a rapid pace and the role of imaging is closely linked with that evolution.

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*“We can use imaging modalities to find the best possible treatment plan based on some extraction of information from the modality itself, whether it be CT, MRI or PET.”*

LUIS E. SELVA, PHD

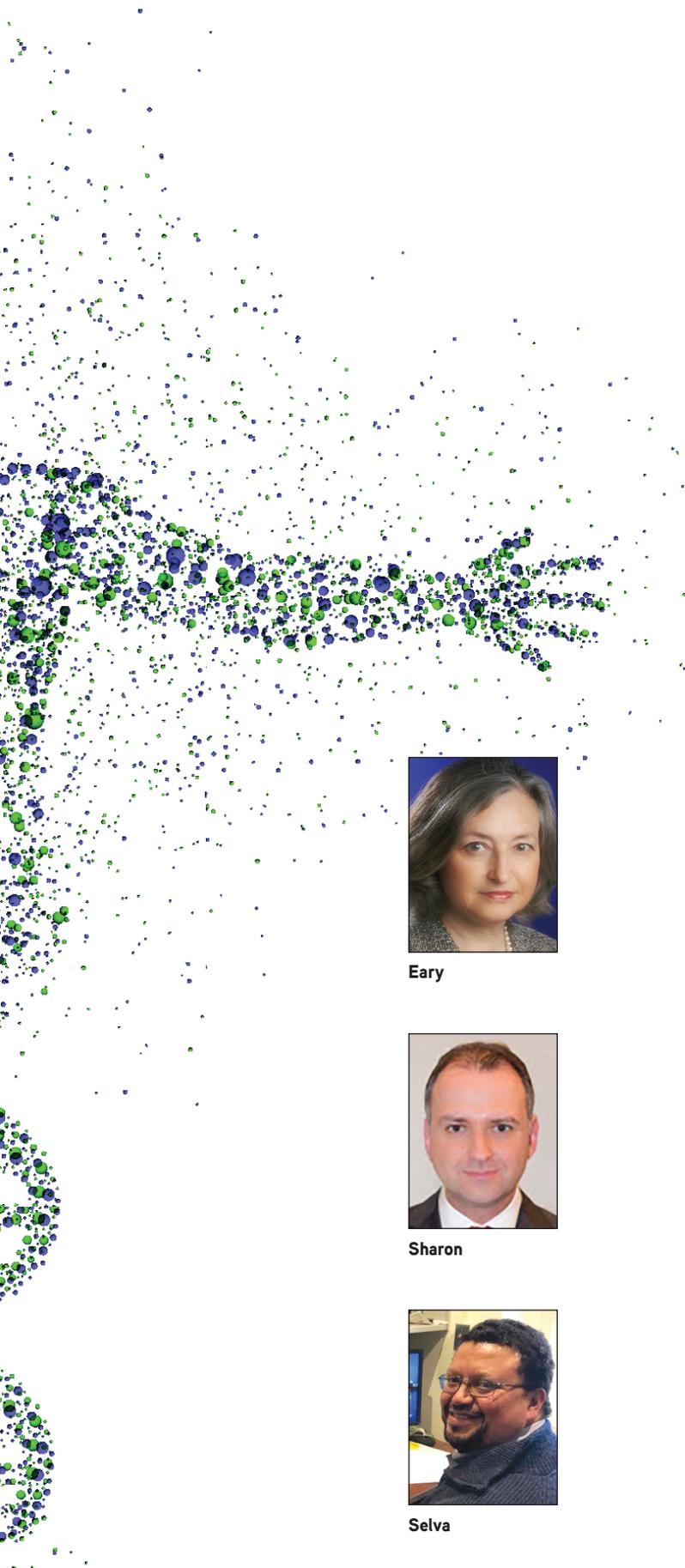
The 2015 initiative, which was developed to pioneer a new model of research to spur biomedical advances and provide clinicians with the tools and therapies needed to target treatments to individual patients, allocated \$70 million from the 2016 federal budget to the National Cancer Institute (NCI) to advance the field of precision oncology.

According to the NCI, the pairing is a natural choice considering that precision medicine uses the genetics of a disease to identify appropriate treatments and that cancer is a disease of the genome.

Similarly, imaging is intrinsically tied to precision medicine as the primary method for observing — or phenotyping — the unexplored regions of the genome, according to Janet F. Eary, MD, deputy associate director of the NCI's Cancer Imaging Program.

“Imaging makes an important contribution in helping understand the phenotype of the patient and the expression of the genomics, proteomics and other aspects of tumors,” Dr. Eary said. “So imaging fits well into the notion that we can select therapies that are really aimed at individual patients.”

*Editor's Note:* This is the first in a series of articles on the role of imaging in precision medicine. The next two articles will cover case-specific prediction of therapeutic outcomes and the role of cross-disciplinary science alliances.



### Targeting Treatment to Individual Patients

The growth of precision medicine has been fueled by the increased capability to gather information on each patient and define disease on a more granular level.

While precision medicine has no single definition, the National Institutes of Health defines it as “an emerging approach for disease treatment and prevention that takes into account individual variability in genes, environment and lifestyle for each person.”

From his perspective as an oncologist with expertise in immunotherapy, Elad Sharon, MD, MPH, medical officer for NCI’s Cancer Therapy Evaluation Program, described precision medicine as the use of a drug or agent that has been developed as a result of a molecular study of a particular target or gene mutation, as opposed to a treatment like chemotherapy which tends to be more nonspecific.

“These kinds of therapies fall under the rubric of precision medicine because we are able to discern that someone lacking the gene or mutation in question should not be treated with a particular agent because it’s unlikely they will get any benefit,” Dr. Sharon said.

One example: The U.S. Food and Drug Administration (FDA) recently modified the indication for the drug erlotinib for the treatment of non-small cell lung cancer, by limiting its use to patients whose tumors have specific epidermal growth factor receptor (EGFR) mutations that are present in a small percentage of lung cancer patients in the U.S.

Because original studies of erlotinib involved the overall non-small cell lung cancer population in a relapsed setting, approval was granted to relapsed patients as a whole. However, the benefit that was seen was likely only a subset of patients. Further studies pointed to the benefits of limiting the use of the drug.

Dr. Sharon says this is a good example of how precision medicine is moving patients toward targeted treatment.

“Prior to this we would have given this drug to the entire population of patients with non-small cell lung cancer,” he said. “Now, with better techniques, we are able to underline the concept that patients are only going to benefit from the therapy if they have the (EGFR) mutation in question.”



Eary



Sharon



Selva

*Continued on next page*



## NCI Perception Lab Returns at RSNA 2017

Launched at RSNA 2016, the National Cancer Institute's (NCI) Perception Lab will continue its research at RSNA 2017. Researchers supported by NCI will conduct studies on radiologic image perception in an open lab environment in the Learning Center. Additionally, the NCI Cancer Imaging Archive will conduct a new image annotation crowd-sourcing activity at RSNA 2017.

### WEB EXTRAS

 Two of RSNA's Quantitative Imaging Biomarkers Alliance (QIBA) Profiles relevant to cancer have been referenced and supported by the federal Cancer Moonshot initiative to increase efforts to prevent, diagnose and treat cancer. For more information, go to [medium.com/cancer-moonshot](http://medium.com/cancer-moonshot).

*Continued from previous page*

Such personalized treatments and therapies would not be possible without imaging, said Luis E. Selva, PhD, health science specialist and biomedical physicist at the VA Boston Healthcare System and the Massachusetts Veterans Epidemiology Research and Information Center (MAVERIC).

"We can use imaging modalities to find the best possible treatment plan based on some extraction of information from the modality itself, whether it be CT, MRI or PET," Dr. Selva said.

### Data Rich Programs Lead to Personalized Care

Dr. Selva is a member of the Precision Oncology Program (POP) founded in 2015 by the VA's New England Healthcare System and MAVERIC, which is a clinical care program with a research component intended to bring personalized healthcare and cutting-edge cancer treatment to veterans. The program is initially focusing on lung cancer but will likely expand to other forms of cancer.

Imaging is critical to the POP, which maintains a public de-identified data set that describes the types of cancers, cancer mutations, stages and treatments that can be used to foster research and cutting-edge therapies.

The POP is a precursor to the Applied Proteogenomics Organizational, Learning and Outcomes (APOLLO) consortium,

a nationwide system to routinely screen patients for genomic abnormalities and proteomic information in order to match their tumor types to specific targeted therapies. APOLLO was founded in 2016 by the U.S. Department of Veterans Affairs, the Department of Defense and the NCI under the umbrella of the NCI's Cancer Moonshot initiative (Read more in Look Ahead, page 5).

To facilitate APOLLO, the New England VA created a research component of the POP — Research-POP (RePOP) — comprising veterans who agreed to share their medical data including clinical, imaging and genomic information, as well as pathology reports, radiotherapy images and treatment plans, inside and outside of the VA, Dr. Selva said.

"The idea is to make all of this data available to researchers and clinicians at the time of diagnosis so we know the previous history of results for patients treated for a certain type of cancer," Dr. Selva said.

He pointed out that clinicians will be able to better target treatments based on information extracted from these different data streams.

"This is where the frontier of precision medicine is heading," Dr. Selva said.

"Having all of these data streams available for clinicians so they can put their patients in the best and most suitable treatment plans is the goal." 

# Subspecialty Second Opinions Often Critical to Patient Care

BY MIKE BASSETT

In light of a growing body of research showing that subspecialty second opinions can be critical to patient care, academic radiology departments may want to consider offering formal second opinions as part of their services, experts say.

Some have already gone that route. The Russell H. Morgan Department of Radiology and Radiological Science at Johns Hopkins University Medical Institution, Baltimore, has been offering second opinions as a service for more than 10 years, said David Yousem, MD, MBA, professor of radiology and director of neuroradiology at Johns Hopkins.

“We’ve found second opinions to be important for patient care,” Dr. Yousem said. “Depending on what field you’re talking about — whether musculoskeletal, head and neck or neuroradiology — the revision rate is substantive and can range anywhere from 8 percent to 30 percent,” Dr. Yousem said.

Similar findings were demonstrated by Fergus Coakley, MD, professor and chairman of diagnostic radiology at the Oregon Health and Science University in Portland, who analyzed data on the value of subspecialist reads published in journals including *Radiology* and the *Journal of Otolaryngology — Head & Neck Surgery*.

In results presented at RSNA 2016, Dr. Coakley and colleagues determined that subspecialist opinions often alter the initial reading of radiologic studies in cancer patients.

“The bottom line is, if you get a subspecialist opinion, 10 to 20 percent of the time it will result in actionable change,” Dr. Coakley said. “And usually — roughly 80 to 90 percent of the time — that change is for the better.”

In one example cited by Dr. Coakley, a patient diagnosed with pancreatic cancer underwent four rounds of chemotherapy before a subspecialist reinterpreted the images. “There was no cancer; there had never been a cancer,” Dr. Coakley said.

An analysis of second opinion subspecialty reads published in the *American Journal of Roentgenology* in 2016 also demonstrated the effectiveness of subspecialty reads.

Researchers analyzed second-opinion subspecialty consults in 3,165 CT and MRI musculoskeletal examinations referred to an academic medical institution

during a 24-month period. Of the 2,326 examinations that had an outside report available for comparison, researchers found 610 (26.2 percent) instances of clinically important differences.

Furthermore, the subspecialty report was more accurate than the outside report in 82 percent of examinations when a pathologic confirmation was made, said study author John A. Carrino, MD, MPH, of the Department of Radiology and Imaging at the Weill Cornell Medical College of Cornell University, New York City.

“There were substantial discrepancies,” Dr. Carrino said. “And having that subspecialty read was quite valuable. It validates the idea that having a subspecialist interpretation is warranted, especially in cases of neoplasm.”

In a 2010 retrospective study in *Radiology*, Elcin Zan, MD, Dr. Yousem and colleagues also demonstrated the value of second-opinion subspecialty consults.

In the research examining 7,465 outside neuroradiology studies, the authors reviewed 4,534 examinations that had an outside report for comparison. The authors found 347 (7.7 percent) instances in which clinically important differences were determined. When a final diagnosis was determined from pathology reports, clinical assessments, and/or imaging follow-up, the second-opinion consult was found to be correct in 84 percent of studies with clinically important differences.

## Reimbursement for Second Opinions

Although the studies showing the effectiveness of second-opinion consults make the case that subspecialists reading these cases should be reimbursed for their services, getting insurance companies on board has been a challenge.

“In general insurers aren’t crazy about paying for multiple interpretations of the same study,” Dr. Yousem said, “particularly



Yousem



Coakley



Carrino

if those second opinions turn into third or fourth opinions.”

But, he pointed out that most institutions do not allow surgeries to proceed without a review of pathology slides. “And insurers have paid for second-opinion pathology slide review without objection,” he said.

“Our policy is that the patient comes first; so whether we are reimbursed, we are going to provide this service to our patients and referring clinicians,” he said.

## Documenting “Curbside Consults”

While academic centers are beginning to adopt formal second-opinion consultations, radiology departments have long provided what Dr. Carrino calls “curbside consults,” in which radiologists provide informal second opinions around the reading room.

“Now there is more pressure to document these kinds of informal consults because you basically have the same medicolegal risks you have for regular reads,” Dr. Carrino said. “So if you are going to do a curbside consult, you might as well file an official report, get it documented, contribute it to clinical management and be compensated.”

And instead of viewing advanced imaging as a commodity, Dr. Carrino adds that it may be equally important to triage the exam to the correct facility where subspecialty radiologists practice. He cites 2017 research in the journal *Spine* showing that where a patient obtains an MRI examination and which radiologist interprets the examination may have a direct impact on radiological diagnosis, subsequent choice of treatment and clinical outcome. 

# Radiologists Seek Global Healthcare Solutions

BY SHELLEY TAYLOR

The World Health Organization estimates that two-thirds of the world lacks access to basic medical imaging services, and that gap leads to large-scale healthcare deficiencies in those regions.

Radiology should think more globally, according to Kristen K. DeStigter, MD, professor of radiology at the University of Vermont, Burlington, chair of the RSNA Committee on International Radiology Education (CIRE), and president and co-founder of Imaging the World (ITW). “The goal should be to focus more on opportunities for education, research and implementation of clinical best practices in underserved locations,” she said.

Several organizations — including RSNA, RAD-AID International (RAD-AID) and ITW — have developed outreach programs that enhance radiology capabilities worldwide.

“RSNA has been a trailblazer in clinical care internationally,” said Matthew P. Lungren, MD, assistant professor of radiology at the Stanford University Medical Center and Stanford Child Health Research Institute Faculty Scholar. “Seeing how RSNA supports this endeavor illustrates how important global radiology really is.”

But any organization tackling global radiology outreach faces numerous

obstacles, notably a lack of sustainability and infrastructure, experts agree.

“Certainly there are areas where progress is being made,” said Robert D. Harris, MD, MPH, clinical professor of radiology in the Division of Body Imaging at the University of Iowa Carver College of Medicine in Iowa City. “It’s kind of a slow process, and sometimes you go backward before you can go forward.”

Tackling those barriers is no small feat. While a number of programs are working to provide outreach, a paradigm shift is needed from donating equipment to assessing specific needs and developing solutions, according to Dr. Lungren. For example, hospitals may have imaging equipment that sits broken and unused because maintenance contracts are non-existent or too expensive.

Dr. Harris, who was a member of the RSNA International Visiting Professor (IVP) team that traveled to the Philippines in 2016, has been taking similar trips for 10 years. He traveled to Nicaragua in 2006 with an informal group of radiologists and later took several



RSNA IVP team members Teresita L. Angtuaco, MD, (third from left), Robert D. Harris, MD, MPH, (center) and Sheila Sheth, MD, (second from right) traveled to the Philippines in 2016.



Director of RAD-AID Cape Verde Program, Robin N. Sobolewski, MD, at Centro de Saude in Mosteiros, Ilha do Fogo, Cape Verde. (Source: RAD-AID International)

trips to Haiti through the American College of Radiology International Outreach Program and Partners in Health. He also spent 11 months in Kigali, the capital of Rwanda, where he experienced first-hand the problem of sustainability with expensive imaging equipment.

“We had a nice CT scanner, but it broke one time. They knew what was wrong, but they didn’t have a service contract, so it lay broken,” he said. “They didn’t have a CT scanner for two months in the biggest public hospital in Kigali,” Dr. Harris noted.

### Capacity Building is Key to Sustainability

As radiology builds infrastructure in areas of need, the goal is sustainability, according to Dr. DeStigter. “We must establish programs and processes that allow radiology teams in resource-insecure countries to function independently,” she said. “Our role is to help with capacity building and capability strengthening — establish best practices for quality and safety, develop teach the teacher and continuing education programs, establish reliable communication networks, guide financial models that will work for the long run — and then to leave.”

ITW was founded with these principles in mind, and the organization is currently integrating ultrasound services in clinical facilities throughout rural Uganda.

Recognizing the need for capacity building led Daniel J. Mollura, MD, to create RAD-AID, a nonprofit platform operating in 25 low-resource countries at 44 hospitals abroad to increase and

improve radiology. RAD-AID enables U.S. and Canadian academic radiology institutions to establish chapters for conducting outreach projects in underserved parts of the world. The 56 chapters receive project guidance, logistical travel support, educational tools, funding, equipment, and legal assistance.

“Because radiology is such a structural backbone for all of the other specialties, if you don’t have effective radiology in low-resource countries, you have a systematic gap in all of healthcare and that becomes a global healthcare problem,” said Dr. Mollura, president and CEO of RAD-AID. “That gap propagates out into deficiencies in caring for cancer, delivering babies and undergoing surgery safely.”

A key factor in capacity building, however, is ensuring that the programs meet the unique needs of each location. When programs are targeted appropriately, they end up looking very different from one region to another.

“It doesn’t make sense to donate mammography machines in a place that can’t take care of breast cancer patients, or CT scanners where there’s no electrical grid,” Dr. Mollura said.

### The Case for a Global Radiology Subspecialty

One solution proposed by Dr. Lungren and others is to establish global radiology as a subspecialty, which could create a systematic approach to education and training, providing radiologists with the skills required to address the needs of low-resource countries. Dr. Lungren and colleagues wrote an editorial on the topic that was published in the November 2016 issue of the *Journal of Global Radiology*.

Developing competency in global radiology requires much more than “a few electives in infectious disease imaging,” Dr. Lungren said. “A dedicated curriculum would provide people who have the passion and desire to do this work with the tools and knowledge they need to understand some of the stakeholders and responsibilities related to the radiology enterprise.”

He said there are two ways to approach this — either build the information into a curriculum or develop fellowships — which both face logistical and financial challenges. But as interest in global radiology grows among trainees, he believes more residency programs will adopt the concept.

*Continued on next page*



Sister Angela (right), pictured with a medical student, is the nurse midwife at Nawanaygo Health Centre III in Uganda, and has been trained through Imaging the World’s (ITW) ultrasound training program to perform and interpret ultrasound at the point of care. (Source: ITW)

*“It doesn’t make sense to donate mammography machines in a place that can’t take care of breast cancer patients, or CT scanners where there’s no electrical grid.”*

DANIEL J. MOLLURA, MD



DeStigter



Lungren



Harris



Mollura

*Continued from previous page*

“In my opinion, a comprehensive global health imaging curriculum is the only sustainable and responsible way forward to successfully address the worldwide lack of access to medical imaging,” Dr. Lungren said.

#### Importance of Cultural Context

Yet fundamental differences persist in the way radiology is practiced in different parts of the world. That is why Dr. DeStigter emphasizes the importance of understanding factors including socioeconomic conditions, political tenor and cultural beliefs, all of which impact the implementation and success of a radiology program.

“The cultural context with which we practice radiology in any one place is so important to the success and to the sustainability of a program,” she said. “Those are the pieces that are often forgotten.”

Dr. Harris agrees. “You have to adjust your thinking. You can’t have western-styled expectations,” he said. 

## INTERNATIONAL RADIOLOGY OUTREACH PROGRAMS AID THE WORLD

*RSNA’s international outreach programs include:*

- The International Visiting Professor program sponsors teams of visiting professors to teach at hospitals and radiology society meetings around the world.
- The RSNA Derek Harwood-Nash International Fellowship provides the opportunity for promising international radiology scholars to study at North American institutions.
- The Introduction to Research for International Young Academics program invites young radiologists from countries outside the U.S. and Canada to learn about careers in academic radiology. The four-day seminar takes place at the RSNA annual meeting. Learn more about RSNA’s international programs at [RSNA.org/International](http://RSNA.org/International).
- CIRE will sponsor a course titled, “Equipment in the Global Radiology Environment: Why We Fail, How We Could Succeed” at RSNA 2017.

Imaging the World is a nonprofit organization that integrates technology, training and community to bring medical expertise and high-quality imaging to remote and under-served areas worldwide. Learn more at [imagingtheworld.org](http://imagingtheworld.org).

RAD-AID International’s mission is to increase and improve radiology resources in the developing and impoverished countries of the world. The nonprofit organization operates in 25 countries with over 7,000 volunteers. Learn more at [rad-aid.org](http://rad-aid.org).

# Researchers Establish Target Doses for Pediatric Chest CT

BY BETH BURMAHL

Radiology researchers have established diagnostic reference ranges (DRRs) for pediatric chest CT, potentially enabling physicians and technologists to better manage pediatric doses while maintaining image quality.



Strauss

A relatively new quality improvement tool, DRR provides a minimum estimated patient radiation dose, below which image quality may not be diagnostic, and an upper estimated patient dose, above which the dose may be larger than necessary.

In new *Radiology* research, lead author Keith J. Strauss, MSc, and colleagues determined DRRs for pediatric chest CT based on the size of a patient's chest. In addition, they developed pediatric dose reduction factors (PDRFs), which allow an estimate of the necessary radiation dose for an individual patient's chest for each unique CT scanner of a facility. The online tool is scheduled to be available on *ImageGently.org*.

While diagnostic reference levels (DRLs) are used as benchmarks for radiation protection, DRRs create a range by establishing a maximum (the same as the DRL) and a minimum recommended estimated patient dose.

"This concept addresses two concerns: appropriate dose level and quality of the image," said Mr. Strauss, Associate Professor at the University of Cincinnati School of Medicine. "The PDRF allows a department to set up target dose values for chest CT exams on any size patient on an as-needed basis."

Co-author Alexander J. Towbin, MD, the Neil D. Johnson Chair of Radiology Informatics at the University of Cincinnati School of Medicine, was instrumental in developing the data allowing the lower bound of the DRR range, Mr. Strauss said.

In the multi-center study, Mr. Strauss and colleagues analyzed three CT dose indexes — CT dose index (CTDI), dose length product (DLP) and a relative new-comer, size specific dose estimate (SSDE) — of 581 patients younger than 21 years old who underwent CT examinations between July 2012 and June 2013. Data was stored in the American College of Radiology (ACR) Dose Index Registry. Five hospitals formed a consortium,

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*"The Pediatric Dose Reduction Factor allows a department to set up target dose values for chest CT exams on any size patient on an as-needed basis."*

KEITH J. STRAUSS, MSC

Quality Improvement Registry in CT Scans in Children (QuIRCC) to conduct the study.

The authors developed DRRs after analyzing the image quality of a subset of 111 CT examinations to validate image quality at the lower range. The PDRF is simply the SSDE for a pediatric patient divided by the SSDE of adult patients at the QuIRCC hospitals.

## Pediatric Dose Reduction Factor Works on Any CT Scanner

The proposed PDRFs provide an acceptable range of SSDEs that should help radiology technologists better manage both radiation dose and image quality, Mr. Strauss said.

"If I am a technologist unsure of the technique to use on a child, I can measure the lateral dimension of the patient and check a PDRF chart to determine the reduction factor to obtain the pediatric dose compared to the adult dose used at the hospital on a given scanner," Mr. Strauss said.

The PDRFs should be especially helpful in adult hospitals, which conduct the majority of CT scans on pediatric patients, Mr. Strauss said. Radiology technologists who might not be familiar with pediatric protocols can access the PDRF chart online or post the chart on the scanner's control console and adjust the patient's radiation dose accordingly, he said.

Even if a hospital has multiple different CT scanners, Mr. Strauss stresses that the same PDRF chart can be used on any of them, since the adult dose — which is determined for each machine based on its unique design and characteristics — is the starting point for calculating the pediatric dose.

"That's the beauty of this technique," Mr. Strauss said. "The PDRF factor should not change over time. Over time as technical improvements to scanners and techniques are developed, these improvements will be incorporated into the facility's unique adult doses — the starting point for all estimates of appropriate pediatric radiation doses."

In 2013 *Radiology* research, the QuIRCC developed PDRFs for abdominal CT that are available on the Image Gently website. 

## Radiology

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### WEB EXTRAS

 Access the 2017 *Radiology* study, "Pediatric Chest CT Diagnostic Reference Ranges: Development and Application," at [RSNA.org/Radiology](http://RSNA.org/Radiology)

 Access the 2013 *Radiology* study, "Diagnostic Reference Ranges for Pediatric Abdominal CT," at [RSNA.org/Radiology](http://RSNA.org/Radiology)

 Access Image Gently at [ImageGently.org](http://ImageGently.org)

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## R&E Grant Leads to Promising Alzheimer's Disease Research

Rahul S. Desikan, MD, PhD, the 2016 Ralph Schlaeger Charitable Foundation Research Fellow Grant recipient, led an international team of scientists who developed a new genetic test for Alzheimer's risk that can potentially be used to predict the age at which a person will develop the disease. The research was recently published in *PLOS Medicine*.

"This work would not have been possible without the RSNA Research & Education (R&E) Foundation imaging grant," said Dr. Desikan, an assistant professor at the University of California, San Francisco, Department of Radiology and Biomedical Imaging. "Thanks in part to the R&E Foundation, I sincerely believe that we will be able to do some good for patients with our new genetic score. A special thanks to the R&E Study Section members who saw the value of this project and the donors who were kind enough to establish this grant."

Dr. Desikan's passion for neuroradiologic research has led to additional studies published in the *American Journal of Neuroradiology*, *Acta Neuropathologica*, and the *Annals of Neuroradiology*.



Rahul Desikan, MD

## 5k Fun Run to Support the RSNA R&E Foundation

Nov. 28 at 6:30 a.m.

Run, jog or walk in the 2017 Fun Run to support education and radiology research. All proceeds benefit the RSNA R&E Foundation, so enjoy an outing for a good cause and join your colleagues along Chicago's beautiful Lake Michigan shoreline. Add the Fun Run to your RSNA 2017 registration. Participants receive a commemorative T-shirt, while supplies last, and the fully tax-deductible donation benefits the RSNA R&E Foundation. In case of inclement weather, the Fun Run may be canceled. All Fun Run fees are non-refundable and non-transferable.



## Education and Funding Opportunities

*Last Call:*

### RSNA Clinical Trials Methodology Workshop

Application Deadline  
**June 15**

Over the course of the 6 ½-day workshop, participants will learn how to develop protocols for the clinical evaluation of imaging modalities. Each participant will be expected to develop a protocol for a clinical study, ready to include in an application for external funding.

The workshop will be held at the Marriott Resort in Coronado, CA, Jan. 6–2, 2018.

Applicants will undergo a competitive selection process for course entrance. Accepted participants are responsible for all travel expenses and hotel accommodations. There are no fees associated with the workshop. Online applications and additional information can be found at [RSNA.org/CTMW](http://RSNA.org/CTMW).

### Advanced Course in Grant Writing

Application Deadline  
**July 1**

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 Science Foundation, or equivalent, grant application. The course, held at RSNA headquarters in Oak Brook, IL, will consist of four 1½-day sessions:

- Session I: Oct. 6–7, 2017
- Session II: Nov. 10–11, 2017
- Session III: Feb. 9–10, 2018
- Session IV: April 20–21, 2018

Accepted participants are responsible for travel expenses for each session. Hotel accommodations will be provided by RSNA. There are no fees associated with this course. For more information and an application, go to [RSNA.org/AGW](http://RSNA.org/AGW).

### Introduction to Academic Radiology for Scientists (ITARSc)

Application Deadline  
**July 1**

Postdoctoral fellows and early-stage researchers in the imaging sciences and biomedical engineering who received their degrees within the past six years are invited to apply for this opportunity to participate in a dynamic program held during RSNA 2017.

The program consists of a combination of dedicated programming for ITARSc participants and shared sessions with participants of the ITAR program. Selected participants will receive a \$1,000 stipend to offset travel and hotel costs as well as free registration for the RSNA annual meeting. Application forms are available at [RSNA.org/ITARSc](http://RSNA.org/ITARSc).

### Applicants Sought for 2018 Derek Harwood-Nash Fellowship

Application Deadline  
**July 1**

Applications for the 2018 Derek Harwood-Nash International Fellowship Program are being accepted through July 1. Interested candidates must be promising international radiology scholars who have completed 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.

Qualified candidates must also specify how the knowledge and experience gained from this fellowship will benefit and improve the practice of radiology in both the home institution and the radiologic community. English proficiency is required. Applications are available at [RSNA.org/DHN](http://RSNA.org/DHN).

## Apply Now: RSNA/AUR/ARRS Introduction to Academic Radiology (ITAR)

Application Deadline  
July 15

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

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

Successful applicants will be assigned to a seminar held during either the RSNA annual meeting in Chicago, Nov. 26–Dec. 1, 2017, or the ARRS annual meeting in Washington, DC, April 22–27, 2018.

A \$1,000 award will be made to the departments of accepted applicants to be used to help advance the applicants' academic careers. There are no fees associated with this program.

For more information and to download an application form, go to [RSNA.org/ITAR](http://RSNA.org/ITAR).



## Creating and Optimizing the Research Enterprise (CORE) Workshop

Registration is open for the 2017 Creating and Optimizing the Research Enterprise (CORE) workshop to be held Oct. 20–21 at RSNA headquarters in Oak Brook, IL. This free workshop focuses on strategies for developing and advancing imaging research programs in radiology, radiation oncology and nuclear medicine departments.

New sessions include “Big Data and AI: The Role for Radiology and How to Get Involved” and “Imaging Research Entrepreneurship.”

The CORE program features a combination of presentations, case studies and group discussions.

For more information and to register, go to [RSNA.org/CORE](http://RSNA.org/CORE).

## New RSNA Online Education Platform Coming in August

RSNA is upgrading its current online education platform in early August. Based on member feedback, the new platform will incorporate an enhanced, mobile-friendly user interface offering more than 600 online activities eligible for SA-CME credit.

Current users of the RSNA eLearn library should complete all online activities by June 30 to ensure a smooth transition of completions and earned SA-CME credits to the new platform. The 2014 online Case of the Day activities and 2015 online Refresher Courses will no longer be accessible after June 30, so purchased activities should be completed by that date.

RSNA members can always access their CME transcripts through the CME repository, which shows completed online activities and SA-CME credits earned. Non-members are encouraged to save copies of CME certificates for online courses completed by June 30 for future reference and record keeping.

For questions or more information, contact the Education Center at [ed-ctr@rsna.org](mailto:ed-ctr@rsna.org) or 630-571-2199.

## For Your Calendar

### JUNE 8–10

InterAmerican College of Radiology (CIR) Refresher Course

Cancun, Mexico

Visit the RSNA booth

- [webcir.org](http://webcir.org)

### JUNE 10

American Medical Association/  
Medical Student Section  
2017 Medical Specialty Showcase  
and Clinical Skills Workshop

Chicago

Visit the RSNA booth

- [AMA-ASSN.org](http://AMA-ASSN.org)

### JULY 9–12

The Association for Medical Imaging  
Management (AHRA) 2017

Anaheim, CA

Visit the RSNA booth

- [AHRA.org](http://AHRA.org)

### OCTOBER 13–16

Journées Françaises de  
Radiologie (JFR)

Paris, France

Visit the RSNA booth

- [JFR.radiologie.fr](http://JFR.radiologie.fr)

FIND MORE EVENTS AT [RSNA.org/Calendar.aspx](http://RSNA.org/Calendar.aspx).

## Radiology in Public Focus

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

### Noninvasive Imaging Helps Predict Heart Attacks

Noninvasive CT angiography and stress tests can help predict which patients are likely to suffer a heart attack or other major adverse cardiovascular events (MACE), according to a new study.

Marcus Y. Chen, MD, from the National Institutes of Health in Bethesda, MD, and colleagues compared invasive and noninvasive approaches in 379 patients who were referred for invasive coronary angiography (ICA) from November 2009 to July 2011. The patient population came from the Combined Noninvasive Coronary Angiography and Myocardial Perfusion Imaging Using 320-Detector Row Computed Tomography (CORE320) prospective multicenter diagnostic study.

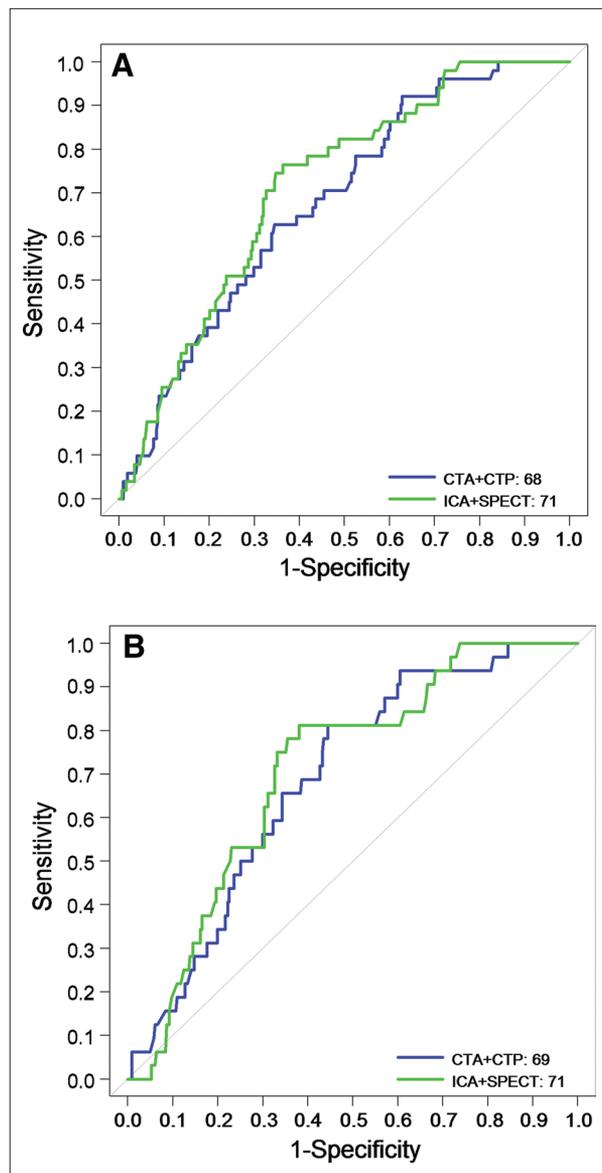
Fifty-one patients, or 13.5 percent, experienced one or more MACE, including 49 revascularizations, five myocardial infarctions, one cardiac death, nine hospitalizations for chest pain or congestive heart failure and one arrhythmia.

Both techniques proved to have similarly high values for predicting MACE at two years after presentation and event-free survival. The two-year MACE-free rates for combined CT angiography and CT perfusion findings were 94 percent negative for coronary artery disease (CAD) versus 82 percent positive for CAD and were similar to combined ICA/single-photon emission CT (SPECT) findings (93 percent negative for CAD vs. 77 percent positive for CAD).

“The traditional approach with invasive catheterization requires that patients go to the hospital, get a catheter inserted into their leg and go in for the nuclear SPECT study on a different day. Now with just one noninvasive test we can get two important but different pieces of information about the coronary arteries,” Dr. Chen said.

**Receiver operating characteristic curves for combined CT angiography and myocardial perfusion imaging (CTA+CTP) and combined ICA and single photon emission computed tomography (ICA+SPECT) used to predict, A, MACE (composite end point of late revascularization (>30 days), myocardial infarction, cardiac death, arrhythmia, or hospitalization for chest pain or congestive heart failure) at 2-year follow-up or, B, late MACE (composite end point of late revascularization (>182 days), myocardial infarction, cardiac death, arrhythmia, or hospitalization for chest pain or congestive heart failure) at 2-year follow-up.**

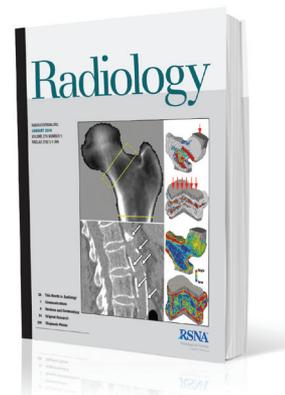
(*Radiology* 2017;283;2:InPress) © RSNA 2017. All rights reserved. Printed with permission.



## Media Coverage of RSNA

In February, 481 RSNA-related news stories were tracked in the media. These stories reached an estimated 586 million people.

Coverage included Voice of America, WGN-AM (Chicago), *TIME*, *Newsweek*, *CBSNews.com*, *CNN.com*, *MSN.com*, *HealthDay*, *ScienceDaily*, *MedPage Today*, *Auntminnie.com* and *Medical News Today*.



## Men's Health Content on *RadiologyInfo.org*

June is Men's Health Month. Do your patients know the role that radiologists play in men's healthcare? Direct them to *RadiologyInfo.org's* Men's Imaging section to access information on radiology exams, treatments and safety topics geared toward men.

## June Public Information Outreach Puts Focus on Men's Health

In recognition of Men's Health 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 radio stations across the U.S. and will focus on prostate cancer risk factors, screening methods and treatment options.

***RadiologyInfo.org***  
For patients

## Member Spotlight

Kenneth C. Wang, MD, PhD



Wang

Dr. Wang is the MRI section chief at the Baltimore Veterans Affairs Medical Center and an adjunct assistant professor of diagnostic radiology at the University of Maryland School of Medicine (UMSM), both in Baltimore. Dr. Wang earned his bachelor's, master's and doctoral degrees in electrical engineering at Stanford University. He earned his medical degree at University of California, San Francisco, followed by a radiology residency and a musculoskeletal fellowship at Johns Hopkins Hospital in Baltimore, MD. He completed an informatics fellowship at UMSM. Dr. Wang completed his fellowships with the support of an RSNA Fellowship Training Grant in 2010. He is the current chair of the RSNA RadLex Committee and serves on the RSNA Radiology Informatics Committee and the Structured Reporting Subcommittee.

### What or who sparked your interest in radiology?

I was first exposed to radiology by my mentor at Stanford, Charles (Charley) Taylor, PhD, when I was an engineering graduate student. We were using MR angiography images to create patient-specific arterial models for computational simulations of blood flow. Working with Charley opened my eyes to a world of possibilities in applying engineering techniques to medicine. Radiology has held an attraction for me ever since, because imaging is at the heart of clinical technology.

### What is the biggest professional challenge you face today?

Like many others, I find it challenging to balance the competing priorities of providing excellent clinical care, furthering the clinical mission through administrative work, teaching trainees, making progress on my research goals, and getting home to my family. While the clinical workflow tends to push us toward efficiency, it seems there is always more to do.

### What is the biggest reward?

I enjoy working on research problems, because research requires us to constantly learn from others while contributing our own ideas. However, what I most enjoy is collaborating with others to deliver high-quality patient care.

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

Being involved in RSNA has been a great way to gain a broader perspective on the practice of radiology. This work helps me to appreciate the continuously evolving nature of what we do, and to participate in that evolution.

### How do you like to spend your free time?

I'm an absolute tennis nut and I've also gotten my wife Rita and our three sons (Alex, Colin and Tyler) into tennis as well. For us, tennis is a nice family pursuit and it's also a great way to end a busy day in the hospital.

## Journal Highlights

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

### Hematogenous Osteomyelitis in Infants and Children: Imaging of a Changing Disease

The clinical and radiologic presentation of acute hematogenous osteomyelitis in children has changed substantially over the past two decades. The disease is now more common, more destructive and more likely to be associated with complications.

In the June issue of *Radiology* ([RSNA.org/Radiology](http://RSNA.org/Radiology)), Diego Jaramillo, MD, MPH, from Children's Hospital of Philadelphia, and colleagues provide an overview of the imaging implications for hematogenous osteomyelitis directed by the changing epidemiology, the newer insights of anatomy and pathophysiology, the imaging characteristics with emphasis on specific locations and disease complications, and the

differential diagnosis considerations.

The researchers conclude that the imaging approach to acute hematogenous osteomyelitis in children has to be directed not just to the detection of the primary focus of infection, but also to the evaluation for collections of pus in the subperiosteal space, soft tissues and joints.

"As it has become clear that more prompt and better-targeted therapy leads to better outcomes, pharmacological and surgical therapies also have been modified. Given the changes in clinical manifestations and management, we must adjust the imaging approach to the disease," the authors write.

## Radiology



**MR image in a one-month-old boy with fever and inability to move the lower extremity. Sagittal non-fat-suppressed T1-weighted image obtained after intravenous administration of gadolinium-based contrast agent shows an area of enhancement in the proximal tibia (black arrow) that extends to the epiphysis. There is also an area of nonenhancement (white arrow) in the calf with an enhanced rim, consistent with a soft tissue abscess.**

(*Radiology* 2017;283;3:629-643) © RSNA 2017. All rights reserved. Printed with permission.

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



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](http://RSNA.org/Radiology-Podcasts).

**Radiology**  
PODCASTS

#### A round-table discussion about gender issues in radiology:

- ▶ "Gender Issues Persist in Academic Radiology Promotions," Christine M. Glastonbury, MBBS, Susan D. Wall, MD, and Ronald L. Arenson, MD.
- ▶ "Gender Differences in Academic Rank of Radiologists in U.S. Medical Schools," Neena Kapoor, MD, and colleagues.

#### A round-table discussion about digital mammography benchmarks:

- ▶ "2017 Breast Cancer Surveillance Consortium Reports on Interpretive Performance at Screening and Diagnostic Mammography: Welcome New Data, But Not as Benchmarks for Practice," Carl J. D'Orsi, MD, and Edward A. Sickles, MD.
- ▶ "National Performance Benchmarks for Modern Screening Digital Mammography: Update from the Breast Cancer Surveillance Consortium," Constance D. Lehman, MD, PhD, and colleagues.
- ▶ "National Performance Benchmarks for Modern Diagnostic Digital Mammography: Update from the Breast Cancer Surveillance Consortium," Brian L. Sprague, PhD, and colleagues.

## Chemoembolization of Hepatocellular Carcinoma with Extrahepatic Collateral Blood Supply: Anatomic and Technical Considerations

Transarterial chemoembolization (TACE) of hepatocellular carcinoma (HCC) through hepatic and extrahepatic collateral (EHC) arteries is essential for achieving optimal therapeutic outcomes. However, determining the presence of EHC arteries is sometimes challenging.

In the May-June issue of *RadioGraphics* ([RSNA.org/RadioGraphics](http://RSNA.org/RadioGraphics)), Amr Soliman Moustafa, MD, PhD, of the University of Arkansas for Medical Science in Little Rock and Zagazig University in Egypt, and colleagues review the factors influencing the development of an EHC arterial blood supply to HCC.

They also describe a systematic approach to enhance the ability to predict the presence of EHC arteries. In addition, they describe the proper technique for TACE of each EHC artery and how to avoid potential technique-related complications.

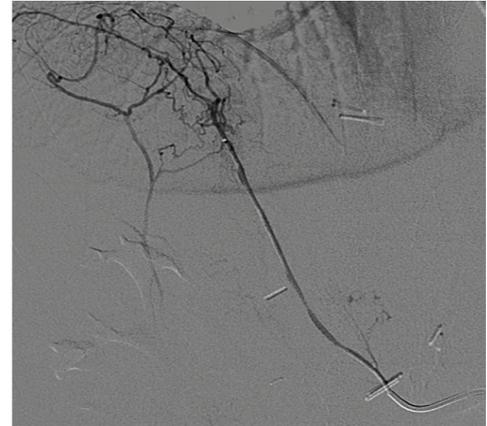
“Performing a combination of conventional CT, cone-beam CT, and angiography is essential for identifying any potential EHC arterial supply to



a.

adequately embolize the tumor for a maximal therapeutic effect. To prevent any technique-related adverse effects, TACE through EHC arteries should be performed by those who have a good understanding of the vascular anatomy,” the authors write.

This article has an Invited Commentary by Douglas M. Coldwell, PhD, MD, Department of Radiology, University of Louisville Hospital, KY.



b.

**Recurrent HCC supplied by the right renal artery in a 68-year-old man with a history of liver transplantation complicated by a hepatic artery aneurysm, for which surgical repair was required. (a) Right renal artery angiogram shows multiple tortuous feeders (arrows) originating from the right renal artery proximal to the renal hilum and supplying a hypervascular HCC (\*) in the dome of the right hepatic lobe. (b) Angiogram shows that subselective catheterization and TACE of one of the feeders were performed without complications.** (*RadioGraphics* 2017; 37:3:963–977)

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**RadioGraphics**

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

## Deadline Nears to Nominate *Radiology* Articles for the 2017 Margulis Award

Deadline for Nominations  
**June 10**

The Nominating Committee for the Alexander R. Margulis Award for Scientific Excellence is accepting nominations from readers for *Radiology* articles published between July 2016 and June 2017. 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 nomination, to Pamela Lepkowski, assistant to the editor, [plepkowski@rsna.org](mailto:plepkowski@rsna.org).

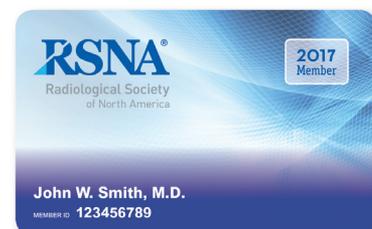
## Value of Membership

## RSNA Career Connect™ Links Radiology Professionals to Open Positions

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

- Search postings or create a search – 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 to attract highly qualified candidates.

Visit Career Connect at [RSNA.org/Careers](http://RSNA.org/Careers). For assistance with fellowship postings, contact Betsy Lockett at [fellowshipconnect@rsna.org](mailto:fellowshipconnect@rsna.org).



## Annual Meeting Watch

# Registration and Hotel Reservations Open

### RSNA 2017 Registration Packages

RSNA offers several new registration options to best meet your needs. Visit [RSNA.org/Registration-Packages](http://RSNA.org/Registration-Packages) for a personalized registration recommendation.

The RSNA Standard package includes everything you've come to expect from medical imaging's leading forum, including six full days of conference access, more than 440 educational courses, 200 scientific presentations, 1,700 oral scientific presentations, more than 650 technical exhibits, CME credit, mobile app and Meeting Central, and networking opportunities.

The Deluxe package includes all the benefits of the Standard package plus complete Virtual Meeting coverage, including 150 live-streamed and on-demand courses, and expanded access through February 2018.

The Premium package includes all the benefits of the Deluxe package plus your choice of either a voucher to use at the annual meeting (includes on-site dining, educational product discounts and premium taxi service) or a six-month trial RSNA membership (if eligible). Limited availability.

The Executive package includes all the benefits included in the Standard package plus an enhanced technical exhibits experience with networking discussions, special hospital administrator symposium programming. Limited availability.

With an incredible array of educational programming, scientific presentations and more, the Virtual Meeting allows you to maximize your ability to experience it all if you are not able to attend in person. The Virtual Only package offers 150 live-streamed and on-demand courses, on-demand CME for select courses, expanded access through February 2018, Cases of the Day, education exhibits and more.

The Technical Exhibits Only package provides one-day access to over 650 exhibitors in both Technical Exhibit Halls. Admission to sessions and/or CME Credit is not available with this package.

Registration Rates (on or before 10/27)

RSNA MEMBERS						Recommended Package: Deluxe					
PACKAGE	Associate	Active	Member in Training	Student	AAPM						
STANDARD	\$0	\$0	\$0	\$0	\$0						
DELUXE	\$150	\$150	\$25	\$25	\$150						
PREMIUM	\$300	\$300	N/A	N/A	\$300						
EXECUTIVE	N/A	N/A	N/A	N/A	N/A						
VIRTUAL (Only)	\$150	\$150	\$25	\$25	\$150						
TECHNICAL EXHIBITS (Only)	N/A	N/A	N/A	N/A	N/A						



### Important Dates

- June 7** General Registration and Housing opens at 10:30 a.m. CT
- June 14** Exhibitor Registration and Housing opens at 10:30 a.m. CT
- July 18** Online Program opens
- Oct. 27** Registrations after this date will incur an added \$150 fee for most categories.
- Oct. 28** Canceling a hotel reservation as of this date will result in the forfeiture of the hotel deposit equal to the first night's room and tax.
- November 26 -December 1** 103<sup>rd</sup> Scientific Assembly & Annual Meeting

NON- MEMBERS								Recommended Package Shown in Purple							
PACKAGE	Physician	Resident/ Trainee	Student	Physicist	Radiology Support Personnel	Hospital or Facility Executive	Industry Personnel								
STANDARD	\$950	\$250	\$0	\$950	\$250	\$950	<b>\$950</b>								
DELUXE	\$1,300	<b>\$600</b>	<b>\$600</b>	<b>\$1,300</b>	<b>\$600</b>	\$1,300	\$1,300								
PREMIUM	<b>\$1,450</b>	N/A	N/A	\$1,450	\$750	\$1,450	\$1,450								
EXECUTIVE	N/A	N/A	N/A	N/A	N/A	<b>\$1,050</b>	\$1,050								
VIRTUAL (Only)	\$600	\$600	\$600	\$600	\$600	\$600	\$600								
TECHNICAL EXHIBITS (Only)	\$325	N/A	N/A	\$325	N/A	\$325	\$325								

## Annual Meeting Watch

### Reserve Your Room Now Through RSNA

We're here for you before, during and after the event with discounted rates so you can enjoy your stay. Register at [RSNA.org/Register](http://RSNA.org/Register) to view hotel rates and availability.

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

- Discounted rates
- Easily modified reservations
- Exclusive amenities
- Exceptional customer service
- Free transportation between hotels and McCormick Place

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



**RSNA's official hotel partners:**

- Experient is the official hotel partner for the RSNA annual meeting. For more information, visit [RSNA.org/Register](http://RSNA.org/Register).
- 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](mailto: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](mailto:stephaniezhu@acemarketing.com.cn).



## Submit Abstracts for High-Impact Clinical Trial at RSNA 2017

The process for submitting abstracts for the High-Impact Clinical Trial (HICT) session at RSNA 2017 opens June 1.

The session features the latest cutting-edge clinical science and research. It will provide a forum for practice-changing clinical research across radiology with the goal to present the most significant work in the field.

**Submissions qualifying for consideration include:**

- First presentations of the primary endpoint(s) of a trial
- Presentations 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
- The latest and “hottest” findings in translational imaging sciences that have immediate clinical implications

Submission deadline is Aug. 1 at noon Central Time. Authors of accepted submissions will be notified Aug. 15. For more information, go to [RSNA.org/AnnualMeeting](http://RSNA.org/AnnualMeeting).



## International Visitors

RSNA is deeply committed to serving all of our members and supporting the vital work being done in North America and abroad to further advance the science of radiology. The pursuit and exchange of science and education is an important part of our goal to improve patient care.

Over 11,000 international attendees participated in RSNA 2016 and RSNA continues to invite radiologists from around the world to take part in our programs and resources.

RSNA encourages all international travelers to the annual meeting and other educational programs to make travel plans as early as possible. Please visit [RSNA.org/Visas](http://RSNA.org/Visas) for information on visas and travel to the United States.

COMING  
NEXT  
MONTH

Next month, *RSNA News* will feature a story on the important role mentors play in guiding the careers of residents.

