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INSIDE WEDNESDAY

► Radiology, Pathology and Genomics Working Together For Better Cancer Diagnosis and Care

The RSNA/AAPM Symposium provides an update on integrated diagnostics for cancer care. **#4A**

- Researchers Compare Ultrasound, MR Elastography for Assessing Liver Fibrosis Which is better for assessing fibrosis in the liver? It depends on the case. #4A
- Fast 5 Speakers Present Ideas to Imagine Possibilities for the Future of Radiology Five presenters from around the world speak five minutes each on a non-clinical topic. #6A
- Physicians, Leadership Share Responsibility for Healthy Workforce
 Working together can help mitigate physician burnout. #6A
- Augmented Reality Improves US-Guided Interventions AR can help improve efficiencies no mat-

ter what level of ultrasound operator. #7A

- Researcher Examines 10 Years of Experience with SVC Filters
 Researcher offers a retrospective review of clinical outcomes for SVC filters. #7A
- Radiologist Draws on Art Background to Create Unique Educational Tool Art can be an educational tool and aid in difficult conversations. #10A
- Patient Focus in Nuclear Medicine Department Enriches Care Experience Nurse coordinator assists with patientcentric nuclear medicine therapy care coordination service. #11A
- Dual-Energy CT Provides Vivid Spectrum of Information
 Radiologists can mine information from this fourth dimension at both a high- and low-energy X-ray spectrum. #12A
- Patient Experience Coach Delivers Value for Radiology Department
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- Experts Discuss the Evolving Role of Radiology in the Outbreak of Vaping-Associated Lung Injury
 Radiologists play a key role in diagnosing, treating and researching the fast-moving disease. #13A

EXCLUSIVE ONLINE CONTENT

- Stroke Thrombectomy Offers Long-Term Clinical Benefits, Cost Savings
- Opioid Crisis Creates Increased Cardiothoracic Complications in Young Adults

INSIDE: EXHIBITOR PRODUCTS



Precision Health Key to Future of Medicine

By Mike Bassett

As radiology looks to the future it should, like the health care system as a whole, start focusing more on precision health, rather than precision medicine, said Sanjiv S. Gambhir, MD, PhD, as he delivered the Annual Oration in Diagnostic Radiology Tuesday at RSNA 2019.

"Most people confuse the two," said Dr. Gambhir, chair of the Department of Radiology at Stanford University School of Medicine in California. However, he explained, they are fundamentally different.

"When we think about precision medicine, we are very focused on things like selecting the right drug for the right person at the right time," he said. But, in the move toward precision health, radiology (and medicine as a whole) has to build the fundamental tools that will allow for an understanding of the risks of different diseases in a given individual, possibly at the time of birth, or even conception, and then monitor the changes in those risks over time.

"Health care will do this through building tools that will become the individualized, customized monitoring tools based on individual risks," Dr. Gambhir said. "And we're starting to see some of these tools evolve."

Dr. Gambhir said these tools will include wearable and implantable devices, and even in-home devices like smart toilets and smart mirrors that will operate in the background at all times and monitor people in personalized ways based on individual risk for disease.



Gambhir

Many of our imaging technologies are pretty good at catching disease when there is high disease burden, but the technology entirely misses at catching low disease burden.

Sanjiv S. Gambhir, MD, PhD

He stressed that radiology will play a key role in precision health. For example, Dr. Gambhir referred to a study that is looking at the potential of using a 5-minute, bilateral quantitative MRI along with video and motion analysis to assess early knee osteoarthritis in order to prevent the transition from a healthy to an arthritic knee. "And that is because we can change the gait properties of a given individual as we can catch those early changes," he said.

It is also likely that imaging will start to evolve to the point where it is used in clothing or wearables, Dr. Gambhir said. For example, a smart bra could potentially screen for early signs of breast cancer.

"It's kind of primitive when you think about how we do breast imaging today," Dr. Gambhir said. "Why should anyone even have to come in for a visit of a given frequency for breast cancer screening? It should be occurring all the time." Instead, smart bra technology through the use of heat-based thermography or photoacoustic strategies could be used for constant monitoring.

CONTINUED ON PAGE 14A

Meltzer Named to RSNA Board

Carolyn C. Meltzer, MD, an internationally recognized neuroradiologist, nuclear physician and distinguished leader in organized radiology, joins the RSNA Board of Directors as the liaison for science.

Dr. Meltzer is the William P. Timmie professor and chair of the Department

of Radiology and Imaging Sciences and executive associate dean of faculty academic advancement, leadership and inclusion at Emory University School of Medicine, Atlanta. She also serves on the board of the Emory Clinic and the Emory Medical Care Foundation. From 2007 to 2019, Dr. Meltzer served as the director of the Innovation Catalyst Program for the Georgia Clinical and Translational Science Alliance and as associate dean for research in the School of Medicine. She established the Emory Center for Systems Imaging to broadly support the advance of imaging capabilities in basic and translational research.

Dr. Meltzer is an advocate for thoughtful professional development and has individually mentored approximately 70 pre- and postdoctoral trainees and junior faculty. Under her leadership as department chair, the Emory Radiology Leadership Academy was created and has now graduated over 100 professionals.

An ardent supporter of identifying opportunities for professionals of all backgrounds, Dr. Meltzer was named the inaugural chair of RSNA's Committee on Diversity and Inclusion in 2018. She also



Mahoney is RSNA President-Elect

Mary C. Mahoney, MD, is president-elect for 2020. Dr. Mahoney is the Benjamin Felson Endowed Chair and Professor of Radiology at the University of Cincinnati (UC) College of Medicine in Cincinnati, Ohio. Since 2016, Dr. Mahoney has been chief of imaging services at UC Health in Cincinnati and is on the medical staff of several Cincinnati area



Mahoney

institutions, including UC Medical Center and West Chester Hospital in West Chester, Ohio.

As president-elect, Dr. Mahoney will continue to drive conversations about patient care with a focus on how artificial intelligence can help radiologists incorporate exceptional patient care into their daily practice.

Over the years, Dr. Mahoney has served RSNA in many capacities. She was the scientific session presiding officer from 2003 to 2009. She has served on many committees, including the R&E Foundation Public Relations Committee and the Public Information Advisors Network. She has chaired the Public Information Committee, Patient-Centered Radiology Steering Committee and the Radiology Editor Search Committee. She joined the RSNA board in 2014.

She is a graduate of the Executive Leadership in Academic Medicine program for women leaders in medicine. She has been instrumental in building the Advanced Imaging Core Lab at UC College of Medicine and the multidisciplinary breast center within UC Cancer Institute.

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Wednesday At a Glance

Annual Oration in Radiation Oncology 1:30 - 2:45 p.m. | (E450A) Lisa A.



use of sophisticated image-guidance and novel adaptive techniques. Increased collaboration between radiation oncology and diagnostic radiology, she says, will pave the way to harness this exciting era of integrating machine learning and artificial intelligence into routine radiation oncology practice. Dr. Kachnic is chair of the Department of Radiation Oncology at the Vagelos College of Physicians, Columbia University in New York, chief of the Radiation Oncology Service at New York-Presbyterian Hospital and associate director for Cancer Network Strategy at the Herbert Irving Comprehensive Cancer Center.

7:15 - 8:15 a.m. **RSNA Diagnosis LiveTM** Body Imaging Case Challenge (E451B) Kachnic, MD **Controversy Session Online Adaptive** Incidental Pancreatic Cyst Management Radiation Therapy (E350) (OART): The True Hot Topic Session Intersection of Mass Casualty Incidents-When Disaster Diagnostic Radiol-Strikes (E451A) ogy and Radiation Oncology 8:30 - 10 a.m. Dr. Kachnic will **Educational Courses** discuss recent BOOST advances in Pediatric (S103CD) radiation delivery. 8:30 a.m. - Noon particularly the Series Courses 10:30 a.m. - Noon **Scientific Paper Sessions** BOOST

Lymphoma (S103CD) 10:30 a.m. - Noon **Innovation Theater Presentations**

(South Hall, Level 3) 10:30 a.m. - 2:20 p.m. **AI Theater Presentations**

(AI Showcase, North Building, Level 2) 12:15 -1:15 p.m.

Scientific Poster Discussions (Learning Center)

1:30 - 2:30 p.m. **BOOST: Protons vs. Photons** How Do Radiation Therapy Centers with Both Decide Which is Right for Their Patients? (S103CD)

2 - 3 p.m. **3D Printing and Advanced Visualization Theater Presentations** 1 - 3 p.m. **Interventional Oncole** Renal Ablation/Emboli 2:30 - 4 p.m. **Educational Courses** 3-4 p.m. Scientific Paper Sessi 3 - 4:15 p.m. **BOOST:** Advanced T **Image-guided Therap** 3:15 - 5:15 p.m. **Interventional Oncole** Clinical Trials in Inter Oncology (S405AB) 4:30 - 5:30 p.m. **BOOST: Lung Stereo Radiotherapy (SBRT** (S103CD) 4:30 - 6 p.m. **Educational Courses RSNA Diagnosis Live** Neuro and MSK (E45 liew the full program a

My Agenda on the RS *Meeting.RSNA.org.*

DailyBulletin

The RSNA 2019 Daily Bulletin is the official publication of the 105th Scientific Assembly and Annual Meeting of the Radiological Society of North America.

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Radiologists have access to

more non-imaging data than we

have ever had before. Integrated

diagnostics is slowly becoming

the norm of radiology practice.

Mitchell Schnall, MD.

Radiology, Pathology and Genomics Working Together for Better Cancer Diagnosis and Care

By Jennifer Allyn

Integrated diagnostics can provide a wide variety of potential benefits to patients facing cancer. It can also give radiologists the opportunity to become more involved in clinical decision support beyond imaging. Speakers addressed the current and future state of integrated diagnostics at Tuesday's RSNA/AAPM (American Association of Physicists in Medicine) symposium.

"The development of new and more sophisticated approaches to diagnostic testing, including medical imaging, anatomic pathology and laboratory medicine, along with the growth in targeted cancer therapies, is transforming the landscape of cancer

diagnosis and care," said Paul E. Kinahan, PhD, symposium moderator, vice chair for radiology research and head of the imaging research laboratory at the University of Washington, Seattle.

Using Tools and Data to Aid Diagnosis

Radiology needs to be empowered to embrace integrated diagnostics through tools, standards and data science, according to Mitchell D. Schnall, MD, who presented The Path to Integrated Diagnostics.

"Developments in artificial intelligence and data science have created additional opportunities to extract and combine information from imaging, pathology, laboratory medicine and genomics to create an opportunity to improve diagnosis by providing access to a broad spectrum of information on each patient," said Dr. Schnall, the Eugene Pendergrass Professor of Radiology at the Perelman School of Medicine at the University of Pennsylvania, Philadelphia. "As a result, radiologists have access to more

> nonimag-

ing data than we have ever had before. Integrated diagnostics is slowly becoming the norm of radiology practice, as we integrate laboratory data with our imaging data and

clinical findings in our daily work." Dr. Schnall acknowledged that cur-

rent approaches to finding data in medical records are cumbersome and time consuming. While there are few standard approaches to integrating the information, the hope is that new standards will evolve to help radiology assist in improving diagnostics.



Schnall

AI can help in identifying

association between genomics,

pathology and imaging features.

Anant Madabhushi, PhD

Madabhushi

Cross-Disciplinary Implementation of Integrated Diagnostics

Regardless of choice of AI approach radiomics or deep learning — there is a need to establish multi-scale disease asso-

ciations, said Anant Madabhushi, PhD, in his lecture, Radio-Patho-Genomics: Computationally Integrated Disease Specific Features Across Scales.

"We need to establish high fidelity ground truth for disease extent on the radiographic imaging to be able to train AI models. However granular, 'ground truth' definition of disease extent is only available on surgical pathology specimens. AI can help in co-registering the ex-vivo specimens with pre-operative imaging, such as rectal, prostate, lung or breast," said Dr. Madabhushi, the F. Alex Nason Professor II of Biomedical Engineering at Case Western Reserve University and a research scientist at the Louis Stokes Cleveland Veterans Administration Medical Center, both in Cleveland.

AI can also be used to create predictors for identifying patients who are likely to have disease recurrence, progression or metastasis, according to Dr. Madabhushi, who has used a combination of AI extracted features from pathology images and CT scans to allow for better recurrence prediction of early stage lung cancer.

The ability to link and associate genomic and molecular information with radiographic patterns on imaging is a future benefit of integrated diagnostics.

"AI can help in identifying association

between genomics, pathology and imaging features," Dr. Madabhushi said. "For instance, there is a great deal of interest currently on developing AI for radiogenomics

and using AI to help identify associations between imaging features and point mutations and biological pathways."

Researchers Compare Ultrasound, MR Elastography for Assessing Liver Fibrosis

By Richard Dargan

Ultrasound (US) and MR elastography (MRE) are both effective methods for assessing fibrosis in the liver. But which works better?

It depends on the case, according to presenters at a Controversy Session Tuesday. Fibrosis impairs liver function and is a

risk factor for the development of cancer. It often arises from alcohol abuse, hepatitis C or nonalcoholic fatty liver disease. Left unchecked, fibrosis can advance to the much more serious condition of cirrhosis.

Elastography, an alternative to biopsy that noninvasively measures the stiffness of tissue in terms of units of pressure called kilopascals (kPa), has become a cornerstone of fibrosis assessment.

"Why are we doing elastography?" asked session co-presenter Paul S. Sidhu, MD, a professor of imaging sciences from King's College Hospital, London. "The answer is, we want to give an accurate assessment of liver diagnosis and what better way to do that than with numbers?"

Elastography can be performed with US or MRI. The US-based approach is more commonly used, having the advantage of wide availability and relatively low cost, Dr. Sidhu said.

Transient elastography, often referred to as FibroScan[®], is perhaps the most wellestablished method. The US transducer transmits a low-amplitude signal to the liver, which induces an elastic shear wave that helps calculate stiffness. The stiffer the liver, the faster the shear wave propagates. The transient approach is noninvasive, repeatable and samples a volume of liver 100 times greater than that of biopsy, Dr. Sidhu said. However, it is operator-dependent and its effectiveness is limited in obese patients and in the presence of ascites, or fluid accumulation.

ARFI is the Wave of the Future

Shear wave elastography and its close cousin, Acoustic Radiation Force Impulse (ARFI) imaging, represent the wave of the future, according to Dr. Sidhu.

"Shear wave is the easiest-to-perform scanning method as it's integrated into the ultrasound system," he said. "It's promising for detection of late stages of fibrosis and cirrhosis, but unproven in early fibrosis."

Research has shown that ARFI can tell with high confidence if a patient's liver is normal or cirrhotic. It is less effective at distinguishing the level of scarring, categorized on a scale from F1 for minimal to F4 for severe.

For that and other applications, MRE has significant value. The exam, performed by placing a passive transducer on the patient's right upper quadrant while they are in the scanner, offers a more advanced assessment of liver fibrosis, according to Scott B. Reeder, MD, PhD, from the University of Wisconsin School of Medicine and Public Health in Madison.

"The big difference with MR is you get more volumetric imaging of liver and a larger sampling," Dr. Reeder said. "In addition, MRI offers better wave penetration, technical feasibility and a higher technical success rate."

MRI can also identify other biomarkers of disease in the liver, something US is not equipped to do.

Dr. Reeder discussed several scenarios where MRE could play a role, including in obese patients, as a follow-up for patients with an abnormal US and in the screening of patients with higher pre-test probability of fibrosis. Treatment monitoring after a biopsy-proven diagnosis represents a particularly vital niche for MRE.

"Also, if you have a patient you're very worried about and there are contraindications to

biopsy such as low platelet counts, then MRE would be a good option," he said.

From a hepatologist's perspective, elastography has been an enormously valuable tool for assessing fibrosis, according to

Laura Kulik, MD, from the Feinberg School of Medicine at Northwestern Medicine in Chicago. Dr. Kulik uses liver stiff-



Left to right: Reeder, Sidhu, Kulik

ness measurements in a variety of ways, such as in the diagnostic workup for cancer. "We don't do as many biopsies as we did in the past," she said. "We do fibrosis measurements instead."



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Fast 5 Speakers Present Ideas to Imagine the Possibilities for the Future of Radiology

The third annual Fast 5 Session on Tuesday featured five presenters from around the world speaking five minutes each on a non-clinical topic. Earlier this year the presenters pitched ideas and competed with many others for the opportunity to speak on the Arie Crown stage in this fast-paced, inspiring session moderated by Richard E. Heller III, MD, MBA.



Bridging the Gap: Patient-Centered Radiology Reports As patients increasingly access their medical records through online health portals, the need to make reports easier to understand has grown.

"We have to remember that access does not equate to understanding," Teresa Martin-Carreras, MD, said of patient portals. "We realized that by improving the readability of our reports, we could provide our patient with immediate relief at a very difficult time."

To improve readability, Dr. Martin-Carreras and colleagues at Penn Medicine developed a system named PORTER (Patient-Oriented Radiology Reporter) which augments radiology reports with illustrations and lay-language definitions.

"The ultimate goal is to enhance patient relationships with our radiologists, because then the possibilities truly are endless," she said.



Patient-centered Lung Cancer Screening CT Clinic: Imagine What You Can Achieve

Lung cancer is the leading cause of cancer-related deaths, taking 129,000 lives each year, said Samir J. Parikh, MD, and the problem, he added, is smoking.

"We have a simple goal: Find cancer at an early stage, help the patient quit smoking and provide a unique and satisfying service," he said.

His approach is to have all new patients in the lung cancer screening clinic receive faceto-face discussion of screening results, meet with a smoking cessation counselor and work with a nurse navigator. And the results are remarkable. After screening 2,800 patients, the team found 75 cancers and improved patients' smoking quit rates from 4% to 10%

"Patients leave very happy," Dr. Parikh said. "If I can save some lives and give those patients more time with family and friends, I have a great sense of satisfaction."



From Science Fiction to Science Fact: Imaging's **Evolving Role in Monitoring & Modifying Mental Health and Social Identity**

Likening modern medical advances to science fiction movies, Michael H. Lev, MD, took the audience through a series of brain imaging innovations with potential to inform strategies to improve emotional health and well-being. For instance, while prescient beings could foresee future criminal acts in the movie The Minority Report, researchers can link brain activity to future social behaviors, language ability and resilience.

"Human brains have evolved to be deeply social," Dr. Lev said, as he highlighted the many opportunities afforded through brain mapping. He showed a remarkable example in which a paralyzed patient was able to control a robotic arm with her thoughts to drink a cup of coffee.



Master the Next Level of **Science Communication** "I love talking about science in a way that people can understand," said Reto Sutter, MD.

He recommended using visual communication methods to help audience members "break through the noise" of thousands of published studies to get their research read. His method of creating visual abstracts uses visual fields to simply and completely present research.

How effective is this approach? Dr. Sutter reported that the use of visual abstracts increase Tweets eight-fold and drive more than two-and-a-half times the average number of downloads for a study.



Child Care Services and Women in Radiology The "Motherhood Penalty" causes systemic disadvantages for working women, Sherry S. Wang, MBBS, said. In fact, 69% of working mothers are passed over for jobs and 72% of mothers and fathers believe women are penalized for having a family, she said.

Working mothers often opt to participate in conferences virtually and are less likely to accept lecture invitations or submit abstracts. The solution, she said, is to actively remove the roadblocks in the career pipeline in order to achieve true equity.

"Only with changes in culture, structure and mindset can we be truly inclusive," Dr. Wang said.

One way to do this is to establish onsite child care services in hospitals to help women become more engaged at radiological meetings and improve recruitment of more women into the field.

Physicians, Leadership Share Responsibility for Healthy Workforce

By Lynn Antonopoulos

Physician wellness is critical to a healthy workforce and both individuals and leadership need to make meaningful changes to mitigate burnout and improve quality and safety in the workplace.

"Individual physician wellness/ burnout is a complex, multifactorial serious issue. It begins with leadership embracing the need for a healthy workforce. It is a shared responsibility between the individual and their leadership to help treat this epidemic " said Claire Bender, MD, MPH, in a Tuesday educational session.

Though not a recognized disease, workplace burnout is Bender a prolonged state of emotional, physical and mental exhaustion caused by excessive and prolonged stress. Dr. Bender, a professor of radiology at Mayo Clinic, Rochester, MN, noted that despite the realities of burnout, there are pockets of radiology professionals who do not recognize it as a problem.

After opening with an acknowledgement



of myths associated with organizational strategies for reducing burnout, such as increased cost and conflicts with organizational objectives, Dr. Bender detailed a series of effective approaches that were echoed by her presenters

According to Dr. Bender, organizations must acknowledge and assess the burnout problem and harness the power of leadership to effect real change. She focused on

restructured approach to scheduling that can

of community at work through formal tion. "Concentrated time of networking and re-networking is necessary and can be achieved in a physician lounge or through other engagement groups," she said.

Dr. Bender said a responsibility shared by both organizations and individuals is better work/life integration. "Work/life balance is of prime importance and leadership really needs to wrap their arms around it, to help individuals give time for self-care and create a divide between home and work."

Shifting to individual responsibility, Dr. Bender admitted radiologists are slow to help themselves and implored her colleagues to find joy and return it to the workplace. She recommended reducing isolationism and refusing to allow administrative tasks to add stress.

She cited lack of time and the fear or shame associated with being unable to handle the workload as significant roadblocks individuals may face when seeking to alleviate burnout.

The Science of Well-Being

The Mayo Clinic developed a self-assessment survey tool called the Well-Being Index (WBI) that measures and tracks well-being over time and is a curated toolkit of radiology-specific resources.

The WBI is helping to build real data to support the study of workplace burnout and professional well-being. we have been talking in soft science, but we need the data and that can be gathered to understand the value and impact of addressing burnout," Dr. Bender said.

"Physician wellness must be incorporated into the value system of leadership of all health care organizations," she said. "The goal of physician leaders must be a healthy and happy workforce. A healthy health care team provides the best, safest and highest quality of care to our patients. That is what they deserve."

developing "work units," a

break up long days in the reading room. She also emphasized cultivating a sense

and informal approaches to peer interac-

Augmented Reality Improves US-Guided Interventions

By Richard Dargan

Augmented reality (AR) helps reduce the time needed for ultrasound (US)-guided needle placements and closes the gap in performance between inexperienced operators and their more experienced counterparts, according to research presented Tuesday.

AR involves the superimposition of a computer-generated image over the user's view of the real world. For US applications, the operator wears an AR headset that displays the live US image superimposed on the patient at the point of interest. This technology, known as AR in situ, or in place, can help guide procedures like needle placements.

"While scanning with the AR *in situ* ultrasound, the displayed, superimposed image is updated in real-time as the operator moves the transducer, displaying the anatomical structures at their correct anatomical location in a 1:1 scale," said study first author Nadja A. Farshad-Amacker, MD, of Balgrist University Hospital Zurich, Switzerland.

"In addition, a larger-sized image of the ultrasound can be displayed, for example, above the patient," Dr. Farshad-Amacker said.

In the study, Dr. Farshad-Amacker and colleagues compared US-guided needle placement with and without AR *in situ* US, independent of the expertise of the operator. Researchers performed the needle placement on medical imaging phantoms, objects used as stand-ins for human tissues.

AR Aids Untrained

Operators Three untrained operators and two experienced radiologists performed 200 US-guided punctures: 100 with and 100 without AR *in situ*



US. The punctures were performed on a

leg phantom with soft tissue lesions and a blood vessel phantom.

AR *in situ* US reduced the mean time to puncture from 30 seconds to 22 seconds. It also reduced the number of needle passes compared to the conventional US technique. The initial gap in the performance of untrained operators vs. experienced radiologists with the conventional method narrowed with the use of the AR system. Inexperienced operators reduced both their average time to puncture and number of needle passes.

"AR *in situ* ultrasound seems to simplify the operator's spatial orientation, reducing experience-based differences in performance of ultrasound-guided interventions," Dr. Farshad-Amacker said.

The technology could benefit patients by providing increased accuracy and speed for US-guided interventions. Increased accuracy would also benefit operators, Dr. Farshad-Amacker said.

"Using AR *in situ* ultrasound, operators could be faster and more precise for ultrasound-guided interventions, since the Using AR in situ ultrasound, operators could be faster and more precise for ultrasound-guided interventions, since the operator can directly aim the needle toward the in situ image of a lesion.

Nadja A. Farshad-Amacker, MD

operator can directly aim the needle toward the in situ image of a lesion," she said.

Future advancements of AR *in situ* US include guidance applications for punctures using trajectory holograms. Also, more mobile systems with cable-free US probes are being developed and will simplify procedures that require sterile conditions.

"This is a proof-of-concept study documenting the potential merits of a novel technology that could be a breakthrough in ultrasound applications," Dr. Farshad-Amacker said. "Clinical studies are needed and planned to illuminate the potential merits of this new technology in vivo."



An AR-guided puncture on a leg phantom. Image courtesy of Nadja A. Farshad-Amacker, MD

Researcher Examines 10 Years of Experience with SVC Filters

By Melissa Silverberg

Although retrievable superior vena cava (SVC) filters have been placed in patients for more than 30 years, controversy still surrounds use of the filters. After conducting a retrospective review of clinical outcomes, one RSNA researcher said he will no longer recommend the use of SVC filters at his institution.

Jorge Lopera, MD, a radiologist at the University of Texas (UT) Health in San Antonio, presented his research, "Single-Center 10-Year Clinical Experience with SVC Filters in the Era of Retrievable Filters," on Tuesday.

"It's not clear if the risk of dying from pulmonary embolism from upper extremity deep venous thrombosis (DVT) justifies the use of SVC filters given the potential serious complications," Dr. Lopera said. Complications or poor outcomes can include filter misplacement, major vessel perforation, pericardial tamponade, lack of follow up or death due to other causes in patients who are already very ill, he said.

Because there has been more research published on inferior vena cava filters (IVC) than SVC, Dr. Lopera was motivated to research outcomes at his institution.

Dr. Lopera and his team conducted a retrospective review of the images and electronic medical records of patients with SVC filters placed between 2008 and 2018. Of the 50 patients studied, ranging in age from

17 to 89 years old, 21 had major neurological conditions such as stroke, 16 had advanced cancers and 13 experienced other severe life-threatening co-morbidities.

Patient demographics, indications for filter placement, type of filter

placed and clinical evolution were recorded. Complications during placement and retrieval were also determined. Contrast-enhanced CT images after the procedure were reviewed, if available, to study filter migration and leg penetration.

The review found that nine of the filters were mispositioned and 11 were significantly tilted, both of which can lead to complications. Ten of the filters showed leg penetration through the SVC wall.

SVC Filters Meant to be Temporary

SVC filters are typically a temporary solution and physicians strive to remove them from the patient relatively soon after placement, but according to Dr. Lopera's review, only 12, or 24%, of the 50 patients at his institution had attempted filter removal — 11 successfully and one technical failure.

Another complicating factor, Dr. Lopera said, is the severe condition of many



In our experience, given the high mortality rate in patients with upper extremity DVT due to their underlying comorbidities, the reported low mortality of pulmonary embolism in these patients, the low retrieval rates and the potential of very serious complications, we do not recommend placement of retrievable SVC filters.

Jorge Lopera, MD

patients who receive SVC filters. Of the 50 patients reviewed, eight died within 30 days of the procedure. In total, 29 patients out of 50 either died or were in terminal condition and not expected to survive more than three months.

Despite having one of the largest clinical experiences with the use of SVC retrievable filters, Dr. Lopera said the study has limitations and that further research is necessary. Deciding whether to use SVC filters is something each institution will need to examine individually, Dr. Lopera said. But for UT Health, the possible benefits do not outweigh the risks.

"In our experience, given the high mortality rate in patients with upper extremity DVT due to their underlying comorbidities, the reported low mortality of pulmonary embolism in these patients, the low retrieval rates and the potential of very serious complications, we do not recommend placement of retrievable SVC filters," Dr. Lopera said.

American Association of Physicists in Medicine

Wednesday's **Physics Tip**

Reducing frame rate in fluoroscopic procedures will reduce dose, but it will also improve image quality when utilizing last image hold. **8**A

RSNA CELEBRATES TOGETHER

This week RSNA gets to celebrate the incredible accomplishments of radiology professionals across career levels and around the world. After a long day of learning, meeting attendees unwind during celebratory receptions and stretch their legs for an early morning Fun Run.



The Gold Medal is RSNA's highest honor. RSNA President Valerie P. Jackson, MD, presented Gold Medals on Tuesday to (*left to right*) D. David Dershaw, MD, N. Reed Dunnick, MD, and J. Anthony Seibert, PhD.







Tuesday morning, more than 500 participants braved the chill along Chicago's lakefront to participate in the RSNA 5k Fun Run. The registered participants raised \$32,060 for the R&E Foundation. The funds will help improve patient care by supporting research and education in radiology through grants and awards to individuals and institutions that advance radiologic research, education and practice. The race winners were Timothy Szczykutowicz *(bottom center)* and Claudia Weidekamm *(top center)*. Other top finishers were Nobuo Tomizawa (Silver) and Francesco Mungai (Bronze) in the men's division, Graciela Garrido (Silver) and Sue Lassman (Bronze) in the womens division.



AI Challenge competitors celebrate their success, trainees toast to a successful year, and R&E Foundation donors relax in the Donor Suite.

Radiologist Draws on Art Background to Create Unique **Educational Tool**

By Melissa Silverberg

Kari Visscher, MD, was an artist before she was a radiologist.

Dr. Visscher completed a master's degree in medical arts before earning her medical degree at the University of Toronto. During her radiology residency, she fell back on her creative training to maintain balance at some of the most difficult times.

"One of the ways I coped was by painting," said Dr. Visscher, now an adjunct professor of radiology at McMaster University in Ontario, Canada. "Artists paint what they do. I do this, so I might as well find ways to paint it."

Dr. Visscher discussed how art can be used as an educational tool for physicians during her Tuesday poster presentation, "Using Art to Engage in Difficult Conversations: A Pilot Study.'

As radiologists continue to explore new ways to make their role in the health care process clear, Dr. Visscher said art can make it happen.

"Through these paintings you can see how the radiologist is part of the health care team, how we interact with patients," she said.

Only one of her paintings shows a solitary radiologist - Dr. Visscher herself sitting in a room reading a scan, which is what people typically assume radiologists do as physicians. Even then, Dr. Visscher made artistic choices to upend that assumption, like painting the doctor in a brightly lit room.

"I wanted to combat that stereotype of the isolated radiologist working in a dark room that doesn't talk to anyone," she said.

Art-Based Learning Aids Difficult Conversations

While creating a series of paintings helped Dr. Visscher work through her own experiences, discussing that art has evolved into a useful educational tool for others. Dr. Visscher leads other physicians and students through conversations about what they see in the paintings, why they think certain artistic

choices were made, and how that art relates to their reallife experiences in health care.

During the 2018 meeting of the Association of University Radiologists (AUR), Dr. Visscher led a session on art reflection to engage radiologists in conversations about wellness, gender, diversity, and other difficult issues. Teaching doctors to look for many layers of meaning in art is not all that different from how radiologists must look deeply at a patient scan, Dr. Visscher said. "It's all part of the same process."

Art-based learning can help doctors and future doctors explore sensitivity and subjectivity, qualities that may not be covered in a traditional medical education curriculum. It can also help radiologists improve their observa-

tional and communication skills, she said. "Story is such a huge part of being an efficient doctor. You need to be able to absorb and interpret people's illness experience and help tell the story of what comes next," she said.

Discussing paintings that depict the work of radiologists also leads to important conversations about the field that may not have happened otherwise.

"It gives you a neutral ground to slow down and talk. We run from day to day, from patient to patient, from study to study. We hardly every stop. I hear back

RSNA



Consultation



Kari Visscher, MD, stands before her self portrait, Diagnosis, during her RSNA presentation.

I wanted to combat that stereotype of the isolated radiologist working in a dark room that doesn't talk to anyone.

Kari Visscher, MD.





Baby Hips

from students that they get so much out of pausing and reflecting in a safe environment," Dr. Visscher said.

It allows doctors to talk about humanity, burnout, biases and other issues that can otherwise be difficult to broach.

"Art allows you to explore at your own pace and see other perspectives you maybe would not

have before," she said.



Patient Focus in Nuclear Medicine Department Enriches Care Experience

By Mike Bassett

As nuclear medicine departments strive to increase their impact in the multi-disciplinary care of patients, they might consider implementing a patient-centric nuclear medicine therapy care coordination service, according to a presentation delivered Tuesday.

"I think these are very important concepts that put radiologists at the center of not only theranostic care, but by extension, even in the diagnostic realm," said David M. Schuster, MD, Division of Nuclear Medicine and Molecular Imaging, Emory University Hospital, Atlanta.

According to Dr. Schuster, the most common model currently in place within many nuclear medicine practices is what he calls the "limited encounter approach," in which nuclear medicine physicians simply carry out what an imaging order has instructed.

Another approach, less common in the U.S. and more common in Europe, Dr. Schuster said, is the independent model where nuclear medicine physicians are more independent and take over the entire aspect of care, including follow-up care and management of toxicities.

Developing a Patient-Centered Model of Care

According to Dr. Schuster, at Emory University Hospital the evolution toward a radiology-driven patient centered model



Schuster

began more than a decade ago when the hospital introduced high-dose sodium iodine therapy in combination with Thyrogen®, a laboratory produced thyroid stimulating hormone, in an outpatient setting.

"This change required a higher degree of coordination with the referring physicians," Dr. Schuster recalled. "And we became frustrated with being treated as technicians."

Patients would often arrive ill-informed and unprepared for thyroid cancer or hyperthyroid therapies. They might be accompanied by young children or partners, be totally ignorant of radiation safety precautions or even unaware that precautions were necessary, Dr. Schuster said.

"And explaining this at the last minute is not ideal.'

Through a patient survey, the nuclear medicine department found that patients were being inadequately briefed by referring physicians and that patients wanted more time with nuclear medicine physicians to help them understand their nuclear medicine procedures in detail.

The original goals were modest," Dr. Schuster said. "We wanted to explain radiation safety precautions and patient preparation guidelines." But in a subtle shift, he explained, he and his colleagues became increasingly instrumental in patient care,

We were establishing closer

patients and taking time to

David M. Schuster, MD.

relationships with our

such as for example, helping to determine whether patients should be treated in inpatient or outpatient settings.

explain more about the actu-"We were establishing closer relationships al medicine to them than with our patients and their endocrinologist could. taking time to explain more about the actual medicine to them than

their endocrinologist could," he added.

"This evolved over time and some endocrinologists pushed back. But others saw value in this, and we have now evolved to the point where they will send patients to us for a consult, even though they are not

considering therapy right away just so we can give them our opinion."

Eventually, they developed checklists and protocols for consults and dedicated time for patient meetings to go through radiation precautions, answer questions and provide written radiation precaution materials.

"Over the years we realized we needed more help doing this," Dr. Schuster said. "Our health system was so enthusiastic about this that now we have a nurse navigator working with us and dedicated to nuclear medicine." That addition has helped the practice realize efficiencies and

> also frees physicians to see more patients and read their studies.

Finally, Dr. Schuster described the emergence of another spectrum of care model that puts nuclear medicine on "equal footing" as part of a multidisciplinary team. In this cooperative

model, nuclear medicine physicians can see patients when needed, manage toxicities, be compensated for their time and have their own resources.

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Preliminary results sug-

gest that such multi-color

contrast, multi-energy CT

images allow novice read-

ers to outperform experts

using conventional CT in

many diagnostic tasks – and

may better enable artificial

intelligence to interpret CT

Benjamin Yeh, MD.

Dual-Energy CT Provides Vivid Spectrum of Information

CT imaging provides profoundly valuable anatomic information to radiologists and physicians. It not only provides 3D information about the size and shape of lesions, but also a rough fourth dimension of information in the form of grayscale Hounsfield Units (HU).

Now, with the use of dual-energy CT (DECT), radiologists can mine even more information from this fourth dimension by simply obtaining data at both a high- and low-energy X-ray spectrum.

Discussing DECT during a Tuesday session, Benjamin Yeh, MD, a radiologist at the University of California San Francisco (UCSF)

Medical Center, noted that every atom on the periodic table blocks X-rays at high and low energy slightly differently.

"With DECT, structures with different atomic make-up, such as iodine, calcium and dense blood or metal, are vividly differentiat-

ed," he said. "Even when they have identical HU on a regular CT, with DECT different materials appear like different colors."

images.

Benefits of Everyday DECT

According to Dr. Yeh, this "color vision"

positions DECT as a potentially transformative technology. "In our daily practice, we encounter ambiguous lesions at CT where we cannot tell whether a density is enhancing, calcified or hemorrhagic because each of those may have similar HU values," he said. "DECT allows for confident and definitive diagnoses by showing us what the underlying atoms are."

DECT also affects the way contrast material is used. For example, with simulated

low-energy images derived from DECT, the HU values of contrast enhancement may be doubled or tripled so imagers can better see hypovascular or hypervascular lesions.

"Alternatively, we get diagnostic-quality images with lower contrast material doses, as is often needed in patients with renal insufficiency or poor IV access," Dr. Yeh added. "Conversely, DECT can simulate

what the scan would look like if the IV contrast was not given at all." Dr. Yeh also pointed out that DECT

resolves many artifacts, including those from metal, motion and beam hardening. Furthermore, DECT can reveal "invisible"



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lesions like hard-to-see tumors, CT-isodense gallstones and bone contusions by revealing differences in atomic makeup between the lesion and similar-HU background tissue or fluid.

DECT Shows Promise for Providing More Data

As DECT becomes more widely available on premium and mid-level CT scanners, radiologists are learning to find intuitive ways to display and interpret the images.

"For many radi-

ologists, handling the large number of possible DECT image reconstructions, which can be unwieldy and confusing, was a hurdle to increased usage," Dr. Yeh said. "Smarter systems now allow radiologists to rapidly switch between DECT reconstructions without having to sort through piles of image series."

Updates have also made DECT scanning easier to use, with some machines not even requiring the technologists to turn on DECT mode anymore.

More profoundly, experimental DECT machines promise to provide data on not just two, but multiple energy spectra, resulting in even better interrogation of atomic

makeup. "Perhaps most exciting are the new

contrast agents with vivid 'colors' that are already in clinical trials," Dr. Yeh said. "Preliminary results suggest that such multi-color contrast, multi-energy CT images allow novice readers to outperform experts using conventional CT in many diagnostic tasks and may better enable artificial intelligence to interpret CT images."

View a video interview with Dr. Yeh at RSNA.org/Bulletin.

RSNA 2019 Press Releases

Press releases are distributed to the media throughout the week highlighting research presented at RSNA 2019. RSNA's media outreach helps increase public awareness of radiology and its role in personal health care. Press releases were distributed on the following Tuesday sessions:

AI Helps Find Signs of Heart Disease on Lung Cancer Screens

Artificial intelligence (AI) provides an automated and accurate tool to measure a common marker of heart disease in patients getting chest CT scans for lung cancer screening, according to a new study from Massachusetts General Hospital and Brigham and Women's Hospital in Boston. The research team developed and trained a deep learning AI system to automatically measure coronary artery calcium on chest CT images. They then tested the system on CT scans from thousands of heavy smokers. The results showed that the deep learning-derived coronary artery calcium scores corresponded closely to those of human readers.

Focused Ultrasound May Open Door to Alzheimer's Treatment

Low-intensity focused ultrasound is a safe and effective way to target and open areas of the bloodbrain barrier, potentially allowing for new treatment approaches to Alzheimer's disease, according to a new multisite study. Researchers delivered focused ultrasound to specific sites in the brain critical to memory in three women, ages 61, 72 and 73, with early-stage Alzheimer's disease and evidence of amyloid plaques. The patients received three successive treatments at two-week intervals. Post-treatment brain MRI confirmed that the blood-brain barrier opened within the target areas immediately after treatment.

Concussion Alters How Information Is Transmitted Within the Brain

Damage from concussion alters the way information is transmitted between the two halves of the brain, according to new research from New York University School of Medicine in New York City. Researchers compared the condition of the corpus callosum in 36 patients with recent concussion to that of 27 healthy controls. They studied the participants' brains with two innovative advances, including an MRI technique that uses measures of water diffusion to provide a microscopic view of the brain's signal-carrying white matter and a processing test that evaluates how well the hemispheres communicate with each other.

Imaging Reveals Pathways Behind Depression

Two new MRI studies identified abnormalities in the brains of people with depression. The first study, from Stony Brook University in Stony Brook, New York, found disrupted integrity in the blood-brain barrier in patients with major depressive disorder. The second study, from the University of North Carolina in Chapel Hill, found that excitation and inhibition in the brain regions in control of executive functions and emotional regulation was reduced in patients with major depressive disorder.

New Study Looks at Motorized Scooter Injuries

More than half of people who received X-rays or CT scans after electric scooter accidents were found to have injuries, most commonly to the upper extremities, according to a new study from Indiana University School of Medicine in Indianapolis. Researchers identified 69 exams performed on 36 unique Emergency Department patients with involvement of an e-scooter. Nineteen of the 36 patients were found to have a radiographically apparent injury. The most common injuries involved the upper extremities, particularly the wrist.



Patient Experience Coach Delivers Increased Value for Radiology Department

By Mary Henderson

When it comes to increasing patient satisfaction with imaging services, Julie Schmittdiel, RN, said it's the human factor that matters most.

"We need to get out of the mindset of rapid turnaround and actually see the patient, consider what they are going through, and act on that," said Schmittdiel, a patient experience coach at Northwestern Memorial Hospital (NMH) in Chicago.

On Wednesday afternoon, Schmittdiel outlined her ongoing efforts to improve patient satisfaction with NMH's radiology services.

"We started by helping radiology staff to better understand what suffering looks like beyond the obvious signs of pain, anxiety and a lack of mobility," Schmittdiel said. "Patients can also suffer when they feel they aren't being heard or acknowledged, when they experience excessive wait times, or are excluded from care decisions."

Schmittdiel's coaching efforts, which began in 2017, focus on three areas: explanation, teamwork and wait time. She advises staff to speak clearly using words patients understand, not acronyms, and to explain



Schmittdiel

each step of their care. "We need to convey that the patient is our priority," she said. "This can be done by assessing a patient's comfort and practicing waiting room 'rounding,' or checking in with patients as they wait."

Schmittdiel said it took a few months for the staff to get comfortable with the concept she calls rounding, but once the behavior was hardwired into daily work-

flows, the results were remarkable. "Staff now view rounding as a necessity and one they actually enjoy," she said.

To facilitate teamwork, Schmittdiel recommends that team members use each

other's names and practice warm 'hand-offs' of patients from one staffer to another. "Patients want good clinicians who

work well together and listen," she said. "A patient who experiences great teamwork is six times more likely to recommend the hospital or provider."

Another big driver of patient satisfac-

tion and recommendations is wait time. In a survey of nearly 20,000 NMH imaging patients, more than 90% of patients who waited less than five minutes said they were likely to recommend their provider. After a 30-minute wait, that group dwindled to 54%.

When waiting is unavoidable, Schmittdiel said communication is critical. Wait times should be acknowledged, she said, with updates provided every 15 minutes along with appropriate apologies.

"Staff often think that informing a patient of a delay will start a confrontation," she said. "Much to the contrary, most patients greatly appreciate being informed."

NMH's multi-pronged approach covered every patient touchpoint from registration, where a corps of volunteers was added to assist and escort patients, to the physical waiting rooms, which were improved with additional seating and better signage. Schmittdiel also provides one-on-one coaching for individual staff and behavioral interviewing training.

Staff recognition programs and teambuilding exercises, including daily huddles between the front and back of departments and meet-and-greets with radiologists, have been a big hit with staff.

"Many of our performance metrics for patient satisfaction realized a 10-point increase from 2018 to 2019 and we've sustained it for a year," Schmittdiel said. "All the work we've done is so worth it to be where we are now. We must embrace all the opportunities we can to make each patient welcome and comfortable during a time when they are vulnerable and possibly in the midst of a life-altering illness."

Wednesday's **Answer**

[Question on page 4A.]

Effects of Radiation Exposure of Children: "Children appear to be less sensitive than adults for the acute effect of moist desquamation, perhaps because of faster repair by the skin cells. Otherwise, there appears to be little or no difference between children and adults in skin sensitivity with regard to tissue reaction." UNSCEAR 2013 Annex B

Experts Discuss the Evolving Role of Radiology in the Outbreak of Vaping-Associated Lung Injury

Schiebler

By Melissa Silverberg

A panel of experts gathered Monday to discuss the recent outbreak of e-cigarette/ vaping-associated lung injuries (EVALI) in the U.S. and the role of radiology in diagnosing, treating and researching the rapidly evolving disease.

During a crowded RSNA 2019 Special Interest Session, experts discussed the scope of the problem and how radiologists can recognize the mysterious lung illness that continues to escalate — particularly among young people. Experts showed scans of patients diagnosed with EVALI, which can present in several different patterns in the lungs.

"It's really tragic that young people are faced with this issue when they thought they were doing something that was safer than cigarettes," said co-moderator Mark Schiebler, MD, professor of cardiothoracic radiology at University of Wisconsin School of Medicine and Public Health, Madison. The session was co-moderated by Jeffrey Klein, MD, RSNA Board Liaison for Publications and Communications and the A. Bradley Soule and John P. Tampas Green and Gold Professor of Radiology at the University of Vermont College of Medicine in Burlington.

Vaping products were originally marketed as a safe way for people to quit smoking, but quickly became popular with young people who were not cigarette smokers. E-cigarettes contain nicotine, which is addictive for users, but can also be mixed with flavoring or marijuana.

According to the New England Journal

of Medicine, in 2019, 25% of high school seniors said they have vaped in the last 30 days, with up to 40% of students that age saying they have ever experimented with e-cigarettes. Those numbers are up from 11% of high school seniors trying e-cigarettes in the last 30 days and 25% ever using them in 2017.

As of late November, the Centers for Disease Control (CDC) has reported 2,290 cases of EVALI and 47

deaths. "I'm hopeful that we are living through the peak of this and that the number of cases will go down as people become more aware of the problem," Dr.

Schiebler said. Studying a public health crisis that is evolving day by day in the news can be difficult, Dr. Schiebler acknowledged. "There's certainly a lot we don't know yet," he said. "We are in the early phases of understanding what is causing this problem. A lot more needs to be done, but people are getting sick every day."

Recently the CDC identified vitamin E acetate as a chemical of concern after testing bronchoalveolar lavage (BAL) fluid samples from the lungs of 29 patients with EVALI from 10 states. Vitamin E acetate is often used as an additive or thickening agent in THC-containing vaping products, according to the CDC. The CDC has not ruled out



Klein

other possible chemicals of concern and is encouraging people not to use vaping products.

Alessandra Caporale, PhD, postdoctoral fellow in the radiology department at the University of Pennsylvania's Perelman School of Medicine, presented her recent *Radiology* research, "Acute Effects of Electronic Cigarette Aerosol Inhalation on Vascular Function Detected at Quantitative MRI."

Her research shows that it may be the vaporization process that is dangerous. Dr. Caporale described how researchers at the University of Pennsylvania performed MRI exams on 31 healthy, non-smoking adults before and after using a nicotine free e-cigarette. Patients experienced reduced blood flow and reduced endothelial function from just one vaping experience.

Radiologists Can Help Recognize, Diagnose EVALI

Brandon Larsen, MD, PhD, a pathologist at Mayo Clinic, Rochester, MN, showed how EVALI can present in the lungs, sometimes in a pneumonia-like form, other times like a toxic inhalation injury, or something else entirely – but often with some opacities in the lungs. Patients often present with coughing, shortness of breath, fatigue, chest pain, nausea, vomiting and diarrhea.

EVALI is a diagnosis that can only be made once other causes are ruled out, said Seth Kligerman, MD, chief of cardiothoracic imaging and associate professor of radiology at the University of California at San Diego.

"If you start to see these patterns in a patient, ask if they have a history of using e-cigarettes," Dr. Kligerman said. "Some people still may not be aware that this is happening so it is important for the radiologist to speak up."

Travis Henry, MD, associate professor of clinical radiology at the University of California, San Francisco, warned that physicians will need to stay on top of evolving research on EVALI as understanding continues to develop.

"This is so new that we still don't know the long-term effects. I suspect we are going to see chronic effects down the road, but we just don't know yet," he said.

View a video interview with Drs. Klein, Schiebler and Kligerman at *RSNA.org/Bulletin*.

CONTINUED FROM PAGE 1A

Mahoney is RSNA President-Elect

Since 2002, Dr. Mahoney has been a manuscript reviewer for Radiology. She is currently on the editorial boards of Cureus and Contemporary Diagnostic Radiology and the editorial advisory board of Radiology Business Journal. Since 2005, Dr. Mahoney has been a Self-Assessment Module reviewer for the American Board of Radiology (ABR).

Dr. Mahoney has held committee or leadership positions in a number of other organizations, including the

CONTINUED FROM PAGE 1A

Society of Breast Imaging (SBI) and the American Roentgen Ray Society. She served on the ABR Board of Trustees and the ABR Board of Governors from 2015 to 2018 and currently serves on the American College of Radiology (ACR) Board of Chancellors. Dr. Mahoney is a fellow of both ACR and SBI and is a member of the Society of Chairs of Academic Radiology Departments.

The recipient of many awards and honors throughout her career, Dr. Mahoney was recognized by

ABR for her extraordinary service and dedication in 2008 and 2010. She was named a Health Care Hero finalist twice by the Cincinnati Business Courier and received a Marquis Who's Who Lifetime Award in 2017.

She was included on the "Best Doctors in Cincinnati" list and was selected for inclusion in Top Doctors in America in 2019.

Dr. Mahoney has been a nationally recognized proponent and staunch advocate of patient-centered radiology. She has been involved in numerous initiatives campaigning to encourage and facilitate radiologists' meaningful engagement in the patient experience.

Dr. Mahoney received her medical degree from UC College of Medicine, and is a member of its honor society, Alpha Omega Alpha. She completed her diagnostic radiology residency-serving as chief resident from 1987-1988, followed by a fellowship-at UC Medical Center.

medal from the Association of Uni-

Dr. Meltzer earned her medical degree from The Johns Hopkins School of Medicine, Baltimore, MD, and completed her fellowship at The Johns Hopkins Hospital. She began her career at the University of Pittsburgh, PA, where she was named medical director of the PET Facility in 1998 and chief of neuroradiology and vice chair of research in the department of radiology in 2002. While there, she was engaged in neuroscience and oncologic imagevaluation of the world's first combined human PET/CT scanner.

CONTINUED FROM PAGE 1A **Precision Health Key**

to Future of Medicine

What Will Be The Role Of The **Future Diagnostic Radiologist?** "Being primarily focused on radiology images alone will

likely set our field up for long-term failure," Dr. Gambhir said.

One possible scenario is that the radiologist becomes the "integrator" of information from different health portals, he said. He reasoned that radiologists are likely to be better at this than other physicians since radiologists are much more technologically savvy, are more likely to embrace technology early, and are more adept at working with data from technology.

Radiology needs to think less about the field as imaging only, and more about its relationship to diagnostics in general, Dr. Gambhir said.

"Many of our imaging technologies are pretty good at catching disease when there is high disease burden, but the technology entirely misses at catching low disease burden. Whether we solve this through a combination of in vitro diagnostics plus imaging or imaging alone will be an important facet of how radiology needs to evolve," he concluded.

Meltzer Named to RSNA Board

serves on the American College of Radiology (ACR) Commission for Women and Diversity, the Steering Committee of the Association of American Medical Colleges Group on Women in Medicine and Science, and she developed and implemented a program to enrich diversity, equity and inclusion at Emory.

A former RSNA Research Scholar grant recipient, Dr. Meltzer serves on the board of trustees for the RSNA R&E Foundation and is a member of the R&E Foundation's Evaluation Committee. She is a former chair of RSNA's task force on Quantitative Imaging Biomarkers Alliance (QIBA) and of the Research Development Committee.

Reflective of her commitment to academic medicine, Dr. Meltzer has served in numerous national leadership roles and on professional and advisory boards including for the National Institute for Biomedical Imaging and Bioengineering, the ACR board of chancellors and as the inaugural chair of the commission on research, the Association of University Radiologists and the International Society of Strategic Studies in Radiology. She serves on the board of directors of the GE-AUR Radiology Research Academic Fellowships,

as secretary-treasurer of the Society of Chairs of Academic Radiology Departments, and as chair of the Coalition for Imaging and Bioengineering Research. She is a past president of the Academy for Radiology and Biomedical Imaging Research and the American Society of Neuroradiology

Highly awarded for her outstanding leadership in research and education, Dr. Meltzer received the Outstanding Contributions in Research Award in 2016 and a gold medal in 2019 from the American Society of Neuroradiology. In 2018 she was recognized as the RSNA Outstanding Researcher and was awarded a gold

versity Radiologists.

ing research and oversaw the clinical

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