

# DailyBulletin

#### INSIDE MONDAY



 Imaging Helps Advance Understanding of Cardiac Effects of COVID-19 and Vaccination

There is growing concern for undetected cardiovascular injury in COVID-19 survivors. **3A** 

- Women's Attitude Toward Breast Screening Results
  In a survey, women showed a readiness to accept false positive v. false negative. 3A
- MRI-Based AI Model Helps Predict Likelihood of Developing Alzheimer's Disease
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- Intensive Blood Pressure Management for Hypertension Protects Brain Function Intensive therapy better for improving brain functional connectivity than standard management. 10A
- ► As Imaging's Role in Cancer Treatment Grows, Interventional Oncology Leads the Way

Interventional oncology is a rapidly expanding subspecialty of interventional radiology. **10A** 

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- COVID Positive College Athletes Face Low Risk of Myocarditis
- Benefits of Digital Breast Tomosynthesis Holding Steady After 10 Years
- Autism Changes Brain's White Matter Over Time
- COVID-19 Fallout May Lead to More Cancer Deaths



# Adaptability, Inclusivity and Empathy Among Keys to Survival in a Post-Pandemic World

By Lynn Antonopoulos

"We have emerged from the pandemic a little worse for wear, but wiser from the experience," said RSNA President, Mary C. Mahoney, MD.



"If we take the lessons we learned from the COVID-19 crisis — adaptability, empathy, patient-centeredness, diversity, equity, inclusion, civility, unity — and apply them in our everyday lives, we can redefine radiology as a value-based, service-oriented specialty that sees patients for who they are — our partners," she said during her President's Address in the Arie Crown Theater Sunday.

The trials of COVID-19, present-day

lessons and discoveries, and the need to provide opportunities, improve representation and remove barriers were the focus of a lecture that included an optimistic view of radiology's future.

Reflecting on the early days of the pandemic, Dr. Mahoney recalled that radiology departments faced staffing shortages, hiring freezes and a revenue loss resulting from a pause in noncritical imaging studies. With little time to prepare, leaders hurried to develop safety protocols while researchers deferred work, and patients put their health care on hold.

"The pandemic opened our eyes to a myriad of issues in our profession, from workflow inefficiencies and staffing vulnerabilities, to stark inequities in patient access to our care," she said.

Radiology professionals were compelled to rethink and reimagine what they do, how they do it and what truly mattered.

According to Dr. Mahoney, some patient populations were particularly vulnerable.

"Health care inequities were laid bare when, because of location, lack of insurance or transportation, fear of losing their jobs or even mistrust of the medical stablishment, people were unable to access the critical care they needed," she said.

However, amid the crisis, Dr. Mahoney said she was inspired by the way the radiology community came together. She highlighted an array of opportunities and initiatives created by RSNA that have helped radiologists worldwide navigate the obstacles of the pandemic and set the stage for future progress in the profession.

CONTINUED ON PAGE 2A

#### Patient-Centered Care Requires a Whole Team Effort By Mary Henderson

By Mary Henderson

It was 2004 and early in the career of James Merlino, MD, when his father died suddenly while hospitalized.

"It was the first time I was on the other side of health care," Dr. Merlino told the audience during Sunday's Opening Lecture. "My father's stay in the hospital was terrible. It gave me a different perspective on what it means to be a patient. I knew I wanted to do something different."

The experience shaped the rest of

Dr. Merlino's career and ultimately led to writing his book *Service Fanatics, How* to Build Superior Patient Experience the Cleveland Clinic Way.

"We shouldn't all have to experience what I did to understand we're all in this together," said Dr. Merlino, chief clinical

"Patients are looking to us to understand what they're going through, they want us to be consistent and to communicate with our colleagues." transformation officer at the Cleveland Clinic. "It's the health care provider's responsibility to the patient experience to consistently ask every day 'what else can we do?""

In addition to working as a colorectal surgeon and leading patient-centric efforts at the Cleveland Clinic, Dr. Merlino also served as president, chief medical officer and chief transformation officer at the consulting firm Press Ganey. More than 30 years in the field have taught him what patients most want from their health care providers: respect, communication and empathy.

CONTINUED ON PAGE 2A



## Monday At a Glance

#### **Plenary Lecture**

11 - 11:45 a.m. | Arie Crown Theater



James A. Brink, MD Radiology in the Value-Based Healthcare Arena: Player or Pawn? Dr. Brink will discuss the importance of establishing the role of medical imaging in the value-based care continuum and ensuring radiology services are delivered at the highest level and at an affordable cost.

View the full program and add sessions to My Agenda at *Meeting.RSNA.org.* 

#### Please note rooms will be cleared for 30 minutes between sessions for cleaning.

**Country Presents: Spain** Why Do Spaniards Live So Long? **Imaging of Longevity** (E353C) 8-9A.M. **Science and Education Sessions** 9 A.M **Discovery Theater Entertainment** 9:30-10:30 A.M. Science and Education Sessions 10 A.M **Grand Concourse Entertainment** 10 A.M. - 5 P.M **Technical Exhibits Industry Presentations** 10 A.M.- 5 P.M. **Professional Portrait Studio** South Hall, Booth 1118

8-9:30 A.M.



#### CONTINUED FROM PAGE 1A

#### **Patient-Centered Care Requires a Whole Team Effort**

"Patients are looking to us to understand what they're going through, they want us to be consistent and to communicate with our colleagues," he said.

At the Cleveland Clinic, the patient experience is not only a strategic priority, it is embedded into the organization's culture and everyday processes.

'Our goal at the Cleveland Clinic is to deliver safe, high-quality, patient-centered care in an environment where people feel cared for as an individual," he said. "It's not about happiness or satisfaction."

#### **Training is Key to Changing Culture**

To improve the patient experience, Dr. Merlino offered a number of suggestions, from developing and communicating a narrative to sharing important data with providers and providing the tools they need, including communication training.

When we focus on our people and make sure that they have what they need, they are more engaged and do better for patients," Dr. Merlino said.

Getting universal buy-in from the entire health care team and improving communication between physicians and nurses is also imperative. Most importantly, the patient experience must be integrated into every process, from onboarding and training to annual reviews that hold providers accountable.

"You can't let patient experience be off in the corner with a group of people who are really passionate about it," Dr. Merlino said.



Merlino

"Every leader in the organization has to be responsible for driving the work and everyone must be involved.'

Going forward, he suggested that health care providers continue to work as they have during the pandemic — being constantly vigilant and thinking about what their patients are going through.

"When you think about all of the work we've accomplished in the past 20 months, it's simply remarkable," Dr. Merlino said. "It has shown us that at its core, health care and its caregivers are highly resilient. Coming together as teams is what made us successful."

Access the Opening Lecture, "Service Fanatics - How to Deliver Safe, High-Quality, Patient-Centric Care," (S5-PLO1) on demand at Meeting.RSNA.org.

#### 10:15 - 11 A.M. What is the RSNA Case Collection

and How Can I Submit a Case? **Discovery Theater** 

#### 11 A.M. - 12 P.M.

Meet the RSNA Journal Editors: Gary D. Luker, M Radiology: Imaging South Hall, Booth 11 A.M. - 12 P.M. Science and Educa 12:15 - 1:15 P.M. **Poster Discussions** Learning Center 1:30-2:30 P.M Science and Educa 2-3:30 P.M. **Resident Competit Discovery Theater** 3-3:30 P.M. Fast 5 Arie Crown Theater 3-4 P.M. Science and Educa 3:30 - 5 P.M. **Image Interpretati** Arie Crown Theater

#### 4-4:30 P.M. Radiology: Imaging Now and the Future **Discovery Theater** 4-5 P.M. **RSNA AI Challens**

**Challenge Recogni** AI Showcase, South

## **DailyBulletin**

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#### **CONTINUED FROM PAGE 1A**

#### Adaptability, Inclusivity and Empathy Among **Keys to Survival in a Post-Pandemic World**

"It is critical that we engage with our colleagues near and far to find global solutions to the challenges that face the medical imaging community," Dr. Mahoney said.

#### **Elevating the Role of Radiology**

Dr. Mahoney acknowledged that despite radiology's ever-present importance in every patient's medical journey, radiologists continue to fight for recognition for the critical role they play in health care.

"It is important that we understand the importance of our role in a value-based system and leverage the tools that enhance our ability to provide subspecialized expertise to patients, the medical community and the public at large," she said.

She also stressed the importance of imaging technology innovation and noted the growing role of artificial intelligence (AI) in opening new avenues for radiologists. "By using technology to improve our

> Monday's **Physics Quiz** Burns cannot occur in a patient undergoing MRI if they are scanned in "Normal Operating Mode" A. True or B. False

workflows, we are then free to focus on what really matters - our patients," Dr. Mahoney said.

After acknowledging the negative effects of isolation during the pandemic, Dr. Mahoney outlined a future in which radiologists are more proactive, find new and better ways to engage with colleagues, communities and patients and work more nimbly, mindfully and empathically. "We also need to ensure that our academ-

ic and society leaders reflect the diverse community we represent," Dr. Mahoney said, adding, "We should identify and remove the barriers to underrepresented minorities and provide opportunities to advance and succeed in all radiology subspecialties.'

Access the presentation, "Redefining Radiology: The Road Ahead," (S5-PL01) on demand at Meeting. RSNA.org.

[Answer on page 5A.]



## **Imaging Helps Advance Understanding of Cardiac Effects** of COVID-19 and Vaccination

#### By Melissa Silverberg

Nearly two years into the COVID-19 pandemic, doctors are still learning new things about the disease that has affected more than 250 million people globally with more than 5 million deaths.

While the disease is primarily a respiratory virus, studies have shown that about one in four patients who require hospitalization for COVID-19 also experience cardiovascular injury, which in turn is associated with a five-to-ten-fold increase in risk of death.

Since many patients do not require hospitalization, there is growing concern for undetected cardiovascular injury in COV-ID-19 survivors.

The discussion was led by Kate Hanneman, MD, MPH, FRCPC, associate professor in the Department of Medical Imaging at Toronto General Hospital, and also included presentations by Brian Burns Ghoshhajra, MD, associate professor of radiology at Massachusetts General Hospital, Boston and Margarita Revzin, MD, associate professor of radiology and biomedical imaging at Yale School of Medicine, New Haven, CT. Each presenter discussed a number of case studies and showed examples of imaging from actual patients.

Dr. Revzin discussed vascular imaging findings, including pulmonary embolism and arterial vascular findings, and the role of vascular imaging in patients with COVID-19. Dr. Burns Ghoshhajra presented on cardiac imaging findings in patients and athletes who have recovered from COVID-19 and the role of imaging in those populations. Dr. Hanneman spoke about

cardiac MRI findings in myocarditis following COVID-19 vaccination as compared to other causes.

**Differentiating Vaccine-Associated Myocardi**tis on Cardiac MRI May Be Challenging

Dr. Hanneman discussed an article she authored that was recently published in Radiology: Cardiothoracic Imaging, "Cardiac



Kate Hanneman

MRI Assessment of Nonischemic Myocardial Inflammation: State of the Art Review and Update on Myocarditis Associated with COVID-19 Vaccination."

The article found that myocarditis has been reported in a small group of people following administration of mRNA-based COVID-19 vaccines with symptoms that typically appear within a few days of vaccination. The U.S. Vaccine Adverse Event

Reporting System (VAERS) received 1,903 reports of myocarditis among people who received at least one dose of a COVID-19 vaccine as of Aug. 18, 2021, in the context of nearly 360 million total doses administered.

The article says that differentiating vaccine-associated myocarditis from other causes of myocardial injury on cardiac MRI may be a challenge as the pattern of findings is similar and there are no longitudinal imaging studies to suggest how long abnormalities persist.

Dr. Hanneman said that as the pandemic continues, research on these topics is still evolving and will continue to advance our understanding of risk factors and long-term outcomes.

"Myocarditis is a very rare adverse event following vaccination and most cases are mild and resolve in the short term, which is encouraging. The risk of cardiac injury related to COVID-19 infection is much higher. Based on the balance of risks and benefits, we should continue to encourage everyone to get vaccinated," she said.

Access the presentation, "Cardiovascular Imaging Manifestations of COVID-19: What the Radiologist Needs to Know," (S1-CVA01) on demand at Meeting.RSNA.org.

## Women Prefer False Positives Over Missed Breast Cancer, **Survey Finds**

#### By Mary Henderson

According to the results of a large German study, the vast majority of women who participate in breast cancer screening prefer a reliable cancer diagnosis over avoiding false-positive findings. Toni Vomweg, MD, a radiologist in the Department of Diagnostic and Interventional Radiology at Radiologisches Institut in Koblenz, Germany, presented the research findings at RSNA 2021.

"The value of mammography is widely recognized and broadly used for screening because of its proven impact on breast cancer mortality," Dr. Vomweg said. "However, other methods, such as ultrasound and MRI, can improve early diagnosis, especially in women with dense breasts."

Compared to mammography, Dr. Vomweg said MRI detects two to three times more breast cancers — but also delivers two to three times as many false-positive findings.

'Some argue that screening methods, such as breast MRI, that further increase the number of false-positive diagnoses compared to mammographic screening are unacceptable to women," he said.

However, Dr. Vomweg said women's preferences for screening methods are unknown. His research team investigated the question with a group of women undergoing routine screening at three sites of the Ger-

man Mammography Screening Program. The program invites all women age 50 to 69 to a digital breast cancer screening with a letter that includes an in-depth explanation of mammographic screening, including its effectiveness, negative effects and the concept of overdiagnosis.

The researchers developed a questionnaire in cooperation with psychologists and women's representatives that explained in clear language that screening methods can cause 'false alarms' (false-positive findings) and can also be false-negative. Women were asked two questions with inversed phrasing whether they preferred a screening method that avoids false-negative diagnoses, even if it increased the rate of false-positives, or whether they wanted a method that avoids false alarms — but may not always find cancer.

Consecutive women presenting for routine screening were offered the questionnaire. Of the 1,126 anonymous questionnaires returned by participants, 906 were complete. Of those, the majority (851 or 93.9%) of participants said they preferred a more sensitive method of breast cancer detection even if it meant accepting more false-positive findings. Only 55 (6.1%) said they preferred avoiding more frequent false

American Association of Physicists in Medicine

is criticized mainly because over-diagnosis, the effects of overtreatment and the harm caused by false-positive diagnosis,"

alarms. The findings

were independent of

the women's age or

level of education.

"Currently, mam-

mographic screening

he said. "However, Germany's age-adjusted incidence and mortality rates from 1999-2017 demonstrates that the over-diagnosis of breast cancer is rare."

Dr. Vomweg said high breast cancer mortality, even in countries with established

#### breast cancer screening programs, is the result of failing to diagnose breast cancer early enough. "We need better not

less breast cancer screening," he said. "There's a lot of room to find more cancer before we get to over-diagnosis."

Access the presentation, "Attitude of Women Towards Screening for Breast Cancer: Readiness to Accept False Positive vs. False Negative Diagnoses," (SPR-BR-23) on demand at Meeting.RSNA.org.

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breast cancer screening.

overdiagnosis."

There's a lot of room to find

more cancer before we get to

Toni Vomweg, MD

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Monday's **Physics Tip** 

Fluoroscopy machines used in high dose interventional radiology procedures should have copper filtration in the beam to reduce skin dose. Even a small amount of Cu can reduce skin dose by 30%.

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## MRI-Based AI Model Helps Predict Likelihood of Developing Alzheimer's Disease

A deep learning model, designed to predict a patient's conversion from mild cognitive impairment (MCI) to dementia, may offer a convenient and efficient clinical solution for early diagnosis of the devastating illness.

#### By Lynn Antonopoulos

Patients with MCI have a 10% to 15% risk of converting to Alzheimer's disease (AD) making early identification of MCI important for planning adequate treatment, according to Eun Kyoung (Amy) Hong, MD, radiologist



at VUNO, Inc. and PhD candidate at Seoul National University Hospital in South Korea and University of Maastricht in the Netherlands,

"There have been several neuroimaging biomarkers introduced to predict conversion from MCI to dementia, however most of them are expensive, invasive and not readily available in clinical practice," Dr. Hong said.

As an alternative to more expensive modalities, Dr. Hong noted that structural MRI (sMRI) features like medial temporal lobe and hippocampus atrophy are useful in predicting conversion from MCI to dementia, but their evaluation requires a high level of expertise and is prone to high inter-reader variability.

She and her colleagues sought to develop an accurate and reproducible approach using computer-aided risk classification based on structural imaging of the brain.

#### **Comparable Results Between sMRI** and Amyloid PET

The team performed a retrospective study of 284 MCI patients who underwent 3D T1-weighted MRI. Of those included, 144 had early MCI (EMCI) and 140 had late MCI (LMCI). From this population, nearly 20% of patients converted from MCI to AD within three years of MCI diagnosis.

The researchers used a previously developed, deep learning-based AD prediction model trained to analyze structural MRI using scans from a total of 1,100 subjects:

550 clinically diagnosed dementia patients and 550 cognitively normal patients.

Training was performed using a deep neural network architecture for computer vision, a field of artificial intelligence (AI) that enables computers to "see" by gathering meaningful information from digital images and other visual input.

The output from the model was presented as an AD probability score, and scores from the deep learning model were compared between the EMCI and LMCI patients and between patients who converted to AD versus those who did not.

Then, the team analyzed the performance of the AD probability score in predicting conversion of MCI to dementia and compared it with that of brain imaging using amyloid PET which detects the build-up of beta-amyloid plaques in the brain, widely thought to play a central role in AD.

The resulting accuracies for the AD probability score and amyloid PET in predicting conversion from MCI to dementia were comparable, and no statistically significant difference in prediction performance was noted between the two modalities.

"It was interesting to see how well the AD probability score differentiated converters from non-converters in EMCI, LMCI and all MCI patients included in the study," Dr. Hong said. "Moreover, the performance of the AD probability score was comparable to amyloid-beta PET, known to be one of the most sensitive biomarkers for dementia."

Looking ahead, Dr. Hong and her team will continue to train, validate and optimize the model for improved performance in clinical use for early diagnosis and treatment of dementia, as well as to expand its development and use the algorithm for other types of dementia in the near future.

The poster presentation, "Introduction of MRI-Based AI Model in Prediction of MCI Conversion to Dementia: Could It Be a Key to Early Diagnosis of Alzheimer's Disease?," (NR03-C8) will take place on Tuesday, Nov. 29 at 4 p.m. Learn more at Meeting.RSNA.org.







AD conversion prediction performance



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## **Tissue Grafts Offer Alternative to Surgery for Patients** With Disc-Related Back Pain

#### By Richard Dargan

A nonsurgical treatment that uses tissue allografting offers pain relief and improvement in function for people with chronically painful degenerative discs in their lower backs, according to research presented at RSNA 2021.

Discogenic back pain occurs when the discs, the fibrocartilaginous structures that act as cushions between the vertebrae of the spine, begin to degenerate. The process of degeneration can start at a relatively early age.

These are patients typically in their twenties, thirties and forties who have chronic lower back pain without associated sciatica," said study lead author Edward Yoon, MD, interventional musculoskeletal radiologist at the Hospital for Special Sur-gery in New York City. "When we take a look on the MRI, we see that one or two of the discs are losing water."

Water dessication causes the disc to lose height, affecting nerves in the area and leading to debilitating pain. Pain medication

"We're providing an alternative therapy that can significantly reduce pain and *improve functional outcome* with just a simple injection."

Edward Yoon, MD

and physical therapy are common treatment options for the condition in its early stages. For chronic conditions, spinal fusion surgery is often the only option. The surgery, in which two or more vertebrae are permanently joined, only works about half of the time. It permanently reduces mobility in the fused area of the spine and can have other nega-Yoon tive long-term effects.

#### **Allografts Show Promise as Alternative** Treatment

The new treatment alternative involves the introduction of an allograft, a tissue graft from a donor that consists of ground nucleus pulposus, the cells that make up the soft gelatinous central portion of the disc. The ground pulposus are mixed with water and more than 6 million viable cells from the vertebral endplate, the bone and cartilage structure that separates the vertebrae and the disc.

"The theory is that allografts help with the pain and the function by restoring the nutrient-rich environment within the disc



as well as increasing its plumpness," Dr. Yoon said.

As part of the Viable Allograft Supplemented Disc Regeneration Trial (VAST), Dr. Yoon and colleagues evaluated 218 subjects with painful discogenic low back pain from 15 U.S. sites. The researchers divided the patients into a treatment group, a non-surgical management group and a placebo control group.

Data on pain, function and adverse events was collected at baseline, and three more times over the next year. Structural outcomes were evaluated by X-rays and MRI at six and at 12 months.

At 12 months, the allograft patients saw clinically meaningful improvements in scores related to pain and function. More than three-quarters of subjects who received allografts responded to treatment and there were no persistently symptomatic adverse

"Patients with these allografts had significant pain reduction as well as functional improvement at the one-year follow-up,"

Dr. Yoon said.

The results of the study, the first prospective, triple-arm, randomized and blinded study of its kind, suggest that disc tissue allograft may be a beneficial nonsurgical treatment for patients who have chronically painful lumbar degenerative discs.

We're providing an alternative therapy that can significantly reduce pain and improve functional outcome with just a simple injection," Dr. Yoon said.

In response to a question from the audience, Dr. Yoon said that the best candidates for the procedure would be people ages 40 or younger who have single degenerative disc disease with axial lower back pain.

Dr. Yoon and his colleagues are analyzing data from the two-year follow-up and will release those results soon.

Access the presentation, "Intervertebral Disc Regeneration Techniques: Viable Allograft For Intervertebral Disc Supplementation - Viable Allograft Supplemented Disc Regeneration Trial (VAST)," (SSMK01) on demand at Meeting.RSNA.org.

#### **RSNA 2021 Press Releases**

Press releases are distributed to the media throughout the week highlighting research presented at RSNA 2021.

#### **COVID-19 Linked to Heart Inflammation in College Athletes**

A small but significant percentage of college athletes with COVID-19 develop myocarditis, according to a new study from the University of Maryland School of Medicine in Baltimore. Clinicians at schools in the highly competitive Big Ten athletic conference collaborated to collect data on the frequency of myocarditis in student-athletes recovering from COVID-19 infection.

Conference officials had required all athletes who had COVID-19 to get a series of cardiac tests before returning to play, providing a unique opportunity for researchers to collect data on the athletes' cardiac status.

Thirty-seven of the athletes, or 2.3%, were diagnosed with COVID-19 myocarditis, a percentage on par with the incidence of myocarditis in the general population. However, an alarmingly high proportion of the myocarditis cases were found in athletes with no clinical symptoms. Twenty of the patients with COVID-19 myocarditis (54%) had neither cardiac symptoms nor cardiac testing abnormalities. Only cardiac MRI identified the problem.

Large International Study Reveals Spectrum of COVID-19 Brain Complications

Approximately one in 100 patients hospitalized with COVID-19 will likely develop complications of the central nervous system, according to a new study from Thomas Jefferson University in Philadelphia.

Researchers analyzed nearly 40,000 cases of hospitalized COVID-19 positive patients from seven U.S. and four western European university hospitals. The patients had been admitted between September 2019 and June 2020. Their average age was 66 years old, and there were twice as many men as women.

There were 442 acute neuroimaging findings that were most likely associated with the viral infection. The overall incidence of central nervous system complications in this large patient group was 1.2%

The most common complication was ischemic stroke, with an incidence of 6.2%, followed by intracranial hemorrhage (3.72%) and encephalitis (0.47%).

#### Monday's

#### Answer [Question on page 2A.]

False. Normal Operating Mode means that typical patients (without implants) will not experience undue heating. Further, they will not feel undue discomfort from the time-varying gradient fields. Patients with implants may still be burned due to interaction between the implant and RF field.



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events.

#### **107<sup>TH</sup> SCIENTIFIC ASSEMBLY AND ANNUAL MEETING** November 28 to December 2 • McCormick Place, Chicago • #RSNA21



RSNA President Mary C. Mahoney, MD, and RSNA Technical Exhibits Committee Chair Cheryl Petersilge, MD, cut the ribbon to kick off the official opening of the RSNA 2021 Technical Exhibits Halls on Sunday. RSNA Board members, industry leaders and key Chicago partners joined the celebration.



RSNA 2021 attendees excited about returning to the RSNA meeting in Chicago are taking advantage of photo opportunities to document their arrival.



On Sunday, RSNA President Mary C. Mahoney, MD, gave her President's Address to hundreds of RSNA 2021 attendees in Arie Crown Theater.





Exhibitors and attendees were energized and engaged when the Technical Exhibits Halls opened on Sunday.



The RSNA annual meeting ribbon wall in Connections Center is always popular as attendees add ribbons to their badges.



### **RSNA Recognizes Honorary Members**, **Outstanding Educator and Outstanding Researcher**

During RSNA 2021, RSNA presented awards for significant achievement in the field of radiology.

#### **Honorary Members**

#### Boris Brkljačić, MD, PhD

Hailed for establishing a lifesaving breast cancer screening program in his native Croatia, Boris Brkljačić, MD, PhD, is chair of radiology at University Hospital Dubrava, Zagreb, and vice dean, full professor and chair of radiology cathedra at the University of Zagreb School of Medicine (UZSM). Dr. Brkljačić also teaches at Hebrew University in Jerusalem and at the University of Iceland in Reykjavik.

Among Dr. Brkljačić's research interests are Doppler ultrasound for exploring vascular flow in kidney disease, head and neck pathology, and peripheral arterial disease. He has also fine-tuned methods for breast imaging, notably introducing BI-RADS to Croatia.

Dr. Brkljačić earned his medical degree from UZSM, followed by a radiology residency in Zagreb and fellowships in the United States, including at Thomas Jefferson University Hospital in Philadelphia and the Memorial Sloan-Kettering Cancer Center in New York. He developed an interest in breast and urogenital imaging as well as vascular and interventional radiology, going on to earn a Master of Science degree and PhD from UZSM.

In addition to his critical work as head of the Radiology Advisory Board of Croatia's Ministry of Health for the National Breast Cancer Screening Programme, Dr. Brkljačić has served in numerous influential leadership positions, including vice president of the Croatian Medical Association, president of the Croatian Society of Ultrasound in Medicine and Biology, and president of the Croatian Society of Radiology. He served on the executive council and board of directors of the European Society of Radiology and is the immediate past president. He is also secretary general for the International Society of Radiology and serves on the board of the International Society for Strategic Studies in Radiology.

Dr. Brkljačić was presented the Andrija Stampar Award from the University of Zagreb in 2020, honoring his dedication to research and mentoring young professionals in the biomedical sciences. He has been named honorary fellow of the European Federation of Societies of Ultrasound in Medicine and Biology and is an honorary member of 10 international radiology societies.

#### Seung Hyup Kim, MD, PhD

A natural leader dedicated to advancing knowledge worldwide, Seung Hyup Kim, MD, PhD, is a professor emeritus of radiology and urology at Seoul National University Hospital and founder of the public education-driven K Radiology Clinic.

A trailblazer in the field, Dr. Kim's devotion to open global collaboration is clear. He served as secretary-general of the 11th Congress of the World Federation for Ultrasound in Medicine and Biology (WFUMB). His work was instrumental in transforming the

Korean Society of Ultrasound

in Medicine (KSUM), and he expanded the society's annual congress to an international one, using the tagline "KSUM Open" and adopting English as a congress language. From 2019 to earlier this year, Dr. Kim served as president of WFUMB.

Dr. Kim has written two volumes of the *Radiology Illustrated* series — Uroradiology and Gynecologic Imaging. He also leads a research institute dedicated to the investigation of treatment for nutcracker syndrome.

Dr. Kim received his medical degree, his master's degree, and his PhD at Seoul National University (SNU). After military service, he became a radiology instructor at SNU and was a visiting radiologist at the Hospital of the University of Pennsylvania. At SNU, his work focused on genitourinary imaging, serving as a professor of radiology and of urology. He was named associate dean of the university, served as chair of the Department of Radiology and then was appointed vice president of the university hospital.

Now retired, Dr. Kim continues to serve as a consultant in kidney ultrasound and urogenital CT and MR, most notably at the Ewha Women's University Mokdong Hospital in Seoul. Dr. Kim also directs a professional imaging clinic in a nephrology hospital, and he has established the website k-radiology.com to freely share tutorials with colleagues and trainees on urogenital topics that may not be extensively taught in clinical settings.

#### Harriet C. Thoeny, MD

Recognized across the globe for her pioneering applications of functional MRI in genitourinary and head and neck radiology, Harriet C. Thoeny, MD, chairs the radiology departments at the Cantonal Hospitals of Fribourg in Switzerland. Dr. Thoeny is also an adjunct professor of urology at the University of Bern and a full professor of radiology at the University of Fribourg.

Dr. Thoeny earned her medical degree at the University of Bern and completed residencies at various Swiss hospitals. During her clinical fellowship in head and neck and genitourinary radiology at the University Hospitals of Leuven (Gasthuisberg) in Belgium, she discovered her fascination with research.

For the last two decades, Dr. Thoeny has led grant-funded research projects that explored diffusion-weighted functional MR in novel applications, many of which are now standard in clinical practice.

A renowned consultant and enthusiastic collaborator, Dr. Thoeny has contributed to the development of international guidelines, including serving on the European Society of Urogenital Radiology (ESUR)/American College of Radiology PI-RADS steering committee. She served as president of ESUR from 2016 to 2018, introducing the European Diploma in Urogenital Radiology.

Dr. Thoeny has served RSNA in several capacities, including as associate editor of Radiology, and a member of the International Advisory Committee, Margulis



Kim

Award Committee and Genitourinary Radiology scientific subcommittee. Since 2017, she has served as vice chair and chair of the RSNA Regional Committee for Europe, providing direction on how RSNA can best meet the needs of members in the region.

Thoeny

Internationally recognized for her leadership in research and education, Dr. Thoeny has been named an honorary member of the Spanish Society of Abdominal Radiology and the French Society of Radiology, and an honorary fellow of the Asian Society of Abdominal Radiology.

#### **Outstanding Educator** Adam E. Flanders, MD

A prolific mentor, author and pioneer for digital learning, Adam E. Flanders, MD, is a professor of radiology and rehabilitation medicine, vice chair of enterprise imaging informatics at Thomas Jefferson University in Philadelphia

Dedicated to serving the profession of radiology, Dr. Flanders was the informatics associate editor for RadioGraphics, and he currently serves on the RSNA News Editorial Board. He has also chaired the Neuroradiology RadLex, Reporting and Medical Imaging Resource Center (MIRC) subcommittees. He served as chair of the **RSNA Radiology Informatics Committee** (RIC), championing the development of robust electronic teaching files, ultimately leading to the development of RSNA Case Collection. He also chaired the RSNA Digital Roadmap Steering Committee. Dr. Flanders participated in and co-authored the "Digital Roadmap" for the National Institutes of Health/RSNA/American College of Radiology (ACR)/The Academy Workshop on Artificial Intelligence in Medical Imaging. He has also helped to facilitate several neuroimaging-based AI Challenges for the RSNA Machine Learning Subcommittee in collaboration with the American Society of Neuroradiology (ASNR).

Dr. Flanders is a past president of the American Society of Spine Radiology (ASSR). He has served in multiple roles for the ASNR, including as chair of its Rules Committee and as deputy editor for NeuroGraphics. He chairs the ASNR Common Data Elements (CDE) workgroup in collaboration with the ACR and RSNA. He works with the Society of Informatics in Medicine (SIIM) in the program committee and was named a SIIM Fellow for his contributions to imaging informatics.

Dr. Flanders earned his medical degree from Rush Medical College in Chicago and he completed a residency in diagnostic radiology at the University of Illinois Medical Center, where he served as chief resident. After completing a fellowship in neuroradiology at Thomas Jefferson University, he joined the Jefferson faculty.

At Jefferson, Dr. Flanders chairs the Imaging Informatics Council for its Enterprise Radiology and Imaging Service Line. He is also actively involved with the Regional Spinal Cord Injury Center of the Delaware Valley (RSCICDV).





Woodard

Flanders

#### **Outstanding Researcher** Pamela K. Woodard, MD, PhD

A leading researcher in cardiothoracic imaging and a generous mentor, Pamela K. Woodard, MD, PhD, specializes in cardiac CT and MR techniques and in translating novel cardiovascular PET radiotracers into human subjects.

Dr. Woodard is the Hugh Monroe Wilson Professor of Radiology and Professor of Biomedical Engineering at the Mallinckrodt Institute of Radiology, Washington University in St. Louis, where she is also the senior vice chair and division director of Radiology Research Facilities. She is also director of the Center for Clinical Imaging Research (CCIR), head of Cardiac MR/CT, and director of the Radiology Research Resident Track and the program director of the NIHfunded T32 TOP-TIER clinician-scientist training program in translational imaging research.

Dr. Woodard received her undergraduate degree from Duke University and her medical degree from the Duke University School of Medicine. She completed her internship in internal medicine at the University of North Carolina at Chapel Hill, a residency in diagnostic radiology at Duke University, and a fellowship in cardiothoracic imaging at the Mallinckrodt Institute of Radiology.

Dr. Woodard currently leads her own research program and is a PI or multiple principal investigator on three NIH R01 grants for the translation of cardiovascular radiotracers into humans. She has nearly 200 peer-reviewed manuscripts, several patents, and has served as a charter member on NIH study sections, including Clinical and Integrative Cardiovascular Sciences (CICS) and Medical Imaging (MEDI), and chair of the NIH study section Imaging Guided Interventions and Surgery (IGIS). She has received numerous awards for her work including being named an Academy of Radiology and Biomedical Imaging Research (ARBIR) Distinguished Investigator.

A revered leader in organized radiology, Dr. Woodard serves on the board of directors of ARBIR and the Missouri Radiological Society. She also serves on the American College of Radiology (ACR) Board of Chancellors as the ACR chair of the Commission on Research. She is a past president of the North American Society for Cardiovascular Imaging. Her expertise has informed the R&E Foundation Research Grant Study Section and the Quantitative Imaging Biomarkers Alliance.

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#### **INDUSTRY FOCUS**

## **Radiography Provides New Anatomical Insights When Viewed in Motion**

#### By Evonne Acevedo

For patients with conditions ranging from neck injury to lung disease, dynamic digital radiography (DDR) can enable a more comprehensive diagnosis — with comparable radiation dose by depicting movement within the body.

DDR takes a series of still images at a very high speed, combining them to create a cine loop, or video, that provides visualization of the dynamic relationship of anatomical structures in a diagnostic-quality view.

For Neill Wright, MD, specializing in neurosurgery at Blessing Health System based in Quincy, IL, this capability helps physicians to better evaluate patients with injuries to the cervical spine.

Blessing employs the KDR® Advanced U-Arm, a fully automated digital radiography system from Konica Minolta that can be used for all standard X-ray studies as well. Motion quantification is possible with Konica Minolta's advanced image processing.

"There are limitations with static X-rays, as we may not get a very accurate picture

of what their neck is doing in motion," Dr. Wright explained. "In patients complaining of significant neck pain where all traditional imaging has failed to show any problems, we are seeing with DDR what was not otherwise diagnosed," he said.

The team at Blessing has found that DDR can help reduce the need for additional or more expensive imaging tests, such as MR or CT, and can be incorporated as part of a typical radiographic workup.

"Before the Blessing Health Center offered DDR, some patients either were not getting imaging for their conditions, or traveled hundreds of miles for a similar, but more costly imaging (study) that exposed them to a higher level of radiation dose,' said Maureen Kahn, RN, MHA, MSN,



Wright

president and chief executive officer. "Now, these patients

and their doctors have an alternative that provides even better image quality, is less harmful, less expensive and is close to their home," she said.

Radiologists at the University of Alabama at Birmingham (UAB) have also added Konica Minolta's DDR to their imaging repertoire. The team has found DDR useful to observe the motion of the lungs and diaphragm, to better analyze and diagnose pulmonary conditions including suspected lung nodules, COPD, and interstitial lung disease.

"DDR allows physicians to see what has not been seen before with static medical radiographic imaging and provides immediate dynamic information, which helps

improve the quality and specificity of diagnosis," said Satinder Singh, MD, chief of cardiopulmonary radiology at UAB. "This single technology provides more information with one test, thereby reducing health care costs and radiation exposure to the patient," Dr. Singh noted.

Konica Minolta Healthcare Americas, Inc. will demonstrate DDR capabilities at booth 6916 at RSNA 2021. See a virtual demonstration at www.Kmhealthcarevirtual. com

## **Experience the World's Largest Medical Imaging Exhibition**

The RSNA 2021 Technical Exhibits Halls are the ideal setting to engage with industry experts and explore the latest medical imaging products and services all in one place. With exhibits from more than 500 leading manufacturers, suppliers and medical information and technology developers, the Technical Exhibit Halls are filled with medical imaging innovation.

Step into the AI Showcase, featuring nearly 100 companies, to discover the latest artificial intelligence (AI) software and solutions and connect with industry experts. The AI Showcase is also home to the RSNA AI Theater where you can immerse yourself in the hottest topics in AI, machine learning and deep learning and get training and networking opportunities.

While visiting the AI Showcase, don't miss the chance to experience the Imaging AI in Practice Demonstration and see the most current AI tools and enhancements in use in real-world clinical scenarios. This series of multi-vendor interoperability demonstrations features 22 vendors and highlights new technology and communication standards needed to integrate AI into diagnostic radiology workflow.

Beyond the AI Showcase, you can find a variety of other focused exhibit areas including the 3D Printing and Mixed Reality Showcase, Recruiters Row and Educators Row. Stop by the 3D Printing and Mixed Reality Showcase to connect with exhibitors and attendees engaged in 3D medical printing research and interact with the latest products in 3D printing, 3D software and augmented and virtual reality.

Recruiters Row is the place to go to explore available career opportunities and connect with prospective employers who are on-hand to meet with candidates. Log on to RSNA's Career Connect at RSNA.org/ Careers to search for participating employers. While you're visiting Recruiters Row, update your headshot at the RSNA Portrait Studio.

If you are interested in connecting with representatives from educational institutions and leading medical associations from around the world, be sure to visit Educators Row. There you can also meet with RSNA

publications staff who are available to answer questions about any of RSNA's peerreviewed journals.

Looking for the newest RSNA 2021 exhibitors? Visit the First-Time Exhibitor Pavilion and connect with more than 20 annual meeting newcomers. Our firsttime exhibitors are identified throughout the exhibit halls with a First-Time Exhibitor logo.

The RSNA annual meeting is well known for the wealth of science and education available, and the Technical Exhibits Halls host an array of demonstrations and learning opportunities available throughout the day. Learn about radiology's latest innovations in the Innovation Theater, an openair theater hosting 15-minute presentations by exhibitors.

Participate in Corporate Symposiums, one-hour education sessions scheduled throughout the week presented by exhibitors and sponsors and attend Vendor Workshops, where you'll participate in classroom-style, user training and product sessions and get firsthand experience on an exhibiting

company's propriety systems. You can also attend Lunch & Learns to participate in panel discussions, demonstrations and lectures while you take a midday meal break.

With everything happening in Technical Exhibits Halls, you'll want to remember to explore the Virtual Exhibition to connect with exhibitors who were unable to travel to Chicago. All RSNA attendees have access to industry programming and the complete Virtual Exhibition through April 30, 2022.

Take some time to watch the 60-minute, educational Virtual Industry Presentations presented by sponsors and the 30-minute Virtual Product Theater Presentations featuring specific exhibitor solutions.

Visit the Virtual Exhibitor Lounge to learn more about our virtual only exhibitors. This unique space includes QR codes that will quickly take you to a virtual exhibitor's online exhibit. Explore the virtual exhibits from comfortable lounge seating with built-in chargers.

Learn more about the RSNA 2021 Technical Exhibits at Meeting.RSNA.org.

### **Technical Exhibits At-A-Glance**

#### **Technical Exhibits Hours**

Sunday – Wednesday 10 a.m. – 5 p.m. South Hall A, Level 3 North Hall B, Level 3

#### AI Showcase

South Hall A, Level 3 (starting at Booth 4129)

**3D Printing & Mixed Reality Showcase** North Hall, Level 3 (starting at Booth 8100)

**Imaging AI in Practice Demonstration** South Hall, within the Al Showcase Booth 4529

**Virtual Exhibitor Lounge** South Hall A, Level 3, Booth 4112

#### **RSNA AI Theater Presentations** South Hall, Booth 5147 Sundav – Wednesdav 10:30 a.m. - 3:45 p.m.

**Innovation Theater Presentations** South Hall, Level 3, Booth 4108 Monday and Tuesday 10:30 a.m. - 3:45 p.m.

Vendor Workshops, Lunch and Learns and Corporate Symposiums See Meeting Program for schedules

Virtual Exhibition and Virtual Industry **Presentations** See Meeting Program for schedules



Dining: RSNA Bistro South Hall and North Hall Sunday – Wednesday Buffet lunch served 11 a.m. – 2:30 p.m.

## Intensive Blood Pressure Management for HTN **Protects Brain Function**

#### By Jennie McKee

Intensive therapy is more effective than standard blood pressure management in helping preserve brain functional connectivity in adults with hypertension (HTN).

Chintan Shah, MD, currently at the Cleveland Clinic, did the work for this study at the University of Pennsylvania and along with his fellow researchers built upon the Systolic blood Pressure INTervention (SPRINT) trial, which randomized 9,361 adults with HTN to receive either standard or intensive blood pressure management.

"The original SPRINT trial demonstrated that inten-

sive management of high blood pressure improved cardiovascular outcomes compared to standard treatment," Dr. Shah said. "The trial served as one key piece of evidence for redefining what we now classify as hypertension; however, there was a slight increase in adverse effects in the intensive therapy group, such as syncope and hypotension, raising the question of whether intensive therapy is also safe and effective for brain health."



Shah

Previous studies have looked at the impact of intensive treatment on cognition and brain structure, demonstrating that intensive treatment yields a protective effect, Dr. Shah noted.

"We felt it was important to continue this line of investigation to determine the impact of intensive blood pressure management on brain function by assessing changes in measures of brain functional connectivity over time in the study partici-

#### pants," he explained.

#### Longitudinal Changes Noticed in Older Patients

In this multi-center trial, the investigators used resting-state functional brain MRI to assess change over time in the strength of specific brain networks, as measured using metrics of functional connectivity. They used an independent component analysisbased approach to identify resting state brain networks and compared the changes over time in 406 participants with two scans that passed quality control.

Intensive therapy was associated with a slight improvement over time in connectivity of the auditory-salience-language network (ASLN) compared to standard therapy, which showed a small decrease over time, specifically in areas corresponding to the salience network. In particular, older patients and those with higher white matter lesion burden had less decline in functional connectivity of the ASLN if they received intensive treatment.

"The longitudinal change in connectivity of the default mode network demonstrated no significant difference between treatment groups," Dr. Shah said.

Although there was a difference in the longitudinal change in connectivity of the ASLN between treatment groups, this was not related to change in overall brain volume or volume of white matter hyperintensities, Dr. Shah noted, which suggests that additional mechanisms may be involved in

"Histotripsy focuses ultrasound waves from

multiple angles onto one point, thus ensur-

ing a very precise killing of the tumor area

while sparing the adjacent tissue."

cognitive dysfunction in HTN patients.

The study's results, he said, suggest that intensive blood pressure lowering is safe and beneficial for brain health, thereby providing more evidence in support of the most recent American College of Cardiology/ American Heart Association guidelines for treatment of hypertension. The guidelines emphasize aiming for a lower target blood pressure and treating hypertension earlier compared to older guidelines.

"Despite the lack of beneficial effect of intensive therapy in the default mode network, these results provide some reassurance that intensive lowering of blood pressure does not demonstrate a measurable decline in mean connectivity within this network," Dr. Shah concluded.

Access the presentation, "Longitudinal Changes In Brain Connectivity In Hypertensive Patients From The SPRINT Trial: Intensive Blood Pressure Management Is Associated With Less Decline In Connectivity," (SSNR01) on demand at Meeting.RSNA.org.

#### As Imaging's Role in Cancer Treatment Grows, Interventional Oncology Leads the Way **Bv Nick Klenske**

Imaging's role in cancer diagnosis and treatment continues to grow in importance. At the forefront of this development is interventional oncology (IO), a rapidly expanding subspecialty of interventional radiology.

"IO's minimally invasive nature makes it particularly advantageous, enabling a cancer to be treated with an entry point the size of a needle instead of the large cutdown or lengthy recovery of surgery," said Nadine Abi-Jaoudeh, MD, a radiologist and director of clinical research at the University of California, Irvine.

Unlike systemic therapies, IO delivers therapies in a locoregional manner, which minimizes toxicity to other organs and even normal tissue in the affected organ. Common examples include thermal ablation, which kills a tumor by either heating or cooling it to extreme temperatures emitted from the tip of a needle introduced into the tumor, and radioembolization, which uses tiny radioactive beads deposited into the tumor to produce lethal tumoral cell damage.

#### **Promising Results on the Use of Combination** Therapies

Speaking at a Sunday educational session, Dr. Abi-Jaoudeh noted that IO is a field full of new developments and exciting discoveries. Take for example locoregional therapies' effect on the tumor microenvironment and immune system modulation.

"Locoregional therapies produce changes in the tumor microenvironment that can induce a small immune reaction to the tumor," she explained. "When locoregional therapies are combined with systemic immunotherapy, this immune reaction can be amplified, resulting in the immune system recognizing tumor antigens, mounting an attack and destroying the tumors."

Dr. Abi-Jaoudeh noted the results of several pre-clinical and human trials using combination therapies to treat liver cancer and colorectal carcinoma. "Patients with

widespread tumors in multiple organs who undergo combination therapy focused on one tumor in the liver may display a response in all the tumors in their body," she said. "This

is particularly

immunotherapies alone have had mixed results, with great success in lung and skin example, colorectal cancer.'

#### A Robust IO Pipeline

While combination strategies may have the ability to overcome the shortcomings of immunotherapy, they are just one example of the progress currently happening in interventional oncology. "There are a lot of exciting developments coming down the IO pipeline, with many new agents being explored," said Dr. Abi-Jaoudeh.

type of agent that could improve the results of chemoembolization. "Unlike doxorubicin, the most common agent used with chemoembolization of primary liver cancer, Tirapazamine becomes activated in a hypoxic environment, meaning it can leverage the physiological consequences of embolization," Dr. Abi-Jaoudeh noted.

In a phase I clinical trial, Tirapazamine embolization demonstrated very encouraging results in the treatment of primary liver cancer.

Dr. Abi-Jaoudeh also highlighted a new



Abi-Jaoudeh

#### exciting because

cancers but very disappointing results in, for

Take for example Tirapazamine, a new

ablation technology called histotripsy, which is in early phase I clinical trials. "While individual ultrasound waves aren't harmful, when they merge at the desired location their combination is lethal," she explained.

## Dr. Abi-Jaoudeh notes that many ques-

**Questions Remain Unanswered** 

tions remain unanswered. "Much of the exact pathophysiological changes in the microenvironment and immune stimulation caused by locoregional therapies remains unknown, and it appears that these changes are unique to each locoregional therapy," she said.

Despite these very exciting developments,

However, with continued research in IO, Dr. Abi-Jaoudeh is confident that imaging guidance's role in treating cancers will only continue to grow.

Access the presentation, "Interventional Oncology: What's New?" (S3-CIR02) on demand at Meeting.RSNA.org.



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