TUESDAY NOVEMBER 28, 2023

THE OFFICIAL NEWSPAPER OF THE RSNA ANNUAL MEETING

RSNA 2023
LEADING THROUGH CHANGE

Daily Bulletin

ONLINE AT RSNA.ORG/BULLETIN

INSIDE TUESDAY

EXCLUSIVE ONLINE CONTENT

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AI and Human Collaboration Can Help Create More Transparent, Egalitarian Leadership Environments

By Evonne Acevedo

As AI continues to demonstrate its utility in an astonishing array of medical imaging applications, human leadership can partner with AI to build a better system of lifelong learning, according to Elizabeth S. Burnside, MD, MPH.

"It's important to intentionally preserve the core manifestations of human intelligence, especially those at the heart of patient care—including judgment, transparency and communication," said Dr. Burnside, a professor and associate dean at the University of Wisconsin School of Medicine and Public Health and co-executive director of the university's Institute for Clinical and Translational Research.

In her plenary lecture, Dr. Burnside showed a series of examples demonstrating key points in the "imaging chain" where AI can offer benefits to each member of the medical imaging team—and illustrated areas where AI may still be problematic.

With a simplistic but illuminating exercise, she tasked an AI program with producing images of Marie Curie, Wilhelm Roentgen and Godfrey Hounsfield in Chicago Cubs uniforms at Wrigley Field. Within the resulting images, the iconic faces, uniforms and stadium were mostly recognizable, but the program had also inserted incongruous structures, placed "fans" on precarious ledges and generated a Hounsfield with three legs.

"Discriminative AI models are primarily used to classify existing data into predetermined outcomes of interest," Dr. Burnside explained. "Generative models, on the other hand, use algorithms to craft high-quality—we hope—content, including text and images based on the data on which they were trained."

In a radiology setting, examples of discriminative AI tasks could be analyzing a chest X-ray and determining whether pneumonia is related to COVID-19 infection, identifying cancer on a mammogram or finding a bleed on a neuroimaging study. A generative model could use images to create a report, improve performance on image segmentation, simulate disease progression in a body system or create summaries for patients in lay language.

Burnside

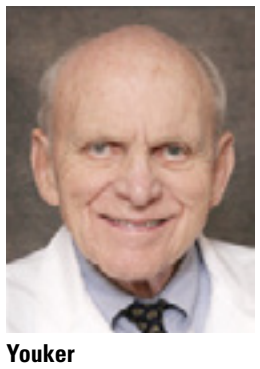
Current Attitudes Toward AI in Radiology

Dr. Burnside presented results from several membership surveys, conducted by both U.S. and European societies, giving the audience a snapshot of members' views on implementing AI in the radiology arena. She also unveiled findings from a yet-unpublished survey that concluded last month, among the Society of Chairs in Academic Radiology Departments (SCARD). The results illustrate respondents' level of optimism about different forms of AI, their interest in its potential applications—such as alleviating burnout—and the cost of its implementation versus the value.

CONTINUED ON PAGE 10

Monday Plenary Session Dedicated to Youker

The Plenary Session on Monday was dedicated to the memory of James E. Youker, MD.



Youker

Dr. Youker was a prolific researcher, master educator and an RSNA Gold Medal recipient.

Dr. Youker received his medical degree from the University of Buffalo School of Medicine in New York. His radiology residency at the University of Minnesota in Minneapolis, was briefly interrupted by two years of military service during which he was chief of radiology at a U.S. naval hospital.

Following his residency, Dr. Youker worked at the Medical College of Virginia in Richmond, the University of California in San Francisco, and the University of Lund in Sweden before being appointed chair of radiology for the Medical College of Wisconsin (MCW). Dr. Youker remained at MCW for 45 years, helping build the institution's faculty organization, establishing the Departments of Radiation and Oncology and Biophysics, and serving on the board of directors and numerous committees. He received an MCW Medical Student Outstanding Teaching Award at age 90. Later, MCW established the James E. Youker Endowed Professorship in Radiology in his honor.

Mahmood is Board Chair

Umar Mahmood, MD, PhD, was named chair of the RSNA Board of Directors.

Mahmood

A radiologist at Massachusetts General Hospital (MGH) in Boston, Dr. Mahmood serves as chief of Nuclear Medicine and Molecular Imaging, where he oversees a service that spans multiple hospitals and facilities in the region. He is director of the Center for Precision Imaging and associate chair of Imaging Sciences in the Department of Radiology at MGH. Dr. Mahmood is also professor of radiology at Harvard Medical School. His career arc has broadly emphasized organizational leadership, research, clinical care and mentoring.

As RSNA chair of the Board, Dr. Mahmood will work with the Board of Directors to support RSNA's work as a convener, connecting people globally through innovative research and education programs.

Dr. Mahmood earned his bachelor's degree from the California Institute of Technology, and his medical degree and doctorate in biophysics and physiology from Cornell University. After completing his doctoral and postdoctoral work in tumor physiology at Memorial Sloan Kettering Cancer Center, Dr. Mahmood went on to complete his radiology residency at MGH in 2001 and has since served on the faculty at MGH and Harvard Medical School.

CONTINUED ON PAGE 10

Tuesday At a Glance

Plenary Lecture
Vin Gupta, MD
11 a.m. | noon Arie Crown Theater

Gupta

The Future of Healthcare Delivery: Considerations for Patients and Providers
Dr. Gupta will address the role of technology in accelerating the transformation of health care, resulting in innovative new treatments and previously unimagined capabilities for managing our health and wellness.

7 - 9 a.m.
RSNA 5k Fun Run
Arvey Field, South Grant Park

8 - 9 a.m.
Science and Education Sessions

8:45 - 9 a.m.
Do You Image Wisely?
Discovery Theater

9 - 9:30 a.m.
Poster Discussions
Learning Center

9 a.m. - 3 p.m.
Learning Center Theater Presentations
Learning Center Theaters

9:30 - 10:30 a.m.
Singapore Presents
Radiology in the Lion City: The Pursuit of Excellence Within 284 Square Miles (E350)

9:30 - 10:15 a.m.
RSNA Connect: Quality & Safety
Connections Center

10 - 11 a.m.
Meet the RSNA Journal Editors: Charles E. Kahn, Jr. MD, MS
Radiology: Artificial Intelligence
South Hall, Booth 1006

10 a.m. - 5 p.m.
Technical Exhibits
Industry Presentations

10 a.m. - 5 p.m.
Professional Portrait Studio
South Hall, Booth 1029

10:30 - 11 a.m.
Fast 5
Arie Crown Theater

10:30 - 11:30 a.m.
Science and Education Sessions

11:45 a.m. - 12: 45 p.m.
Poster Discussions
Learning Center

12 - 12:45 p.m.
Center Stage Presentations
Innovation Theater
South Hall, Booth 3315

1 - 2 p.m.
Science and Education Sessions

2 - 3 p.m.
Meet the RSNA Journal Editors: Susanna I. Lee, MD, PhD
Radiology Advances
South Hall, Booth 1006

2 - 5 p.m.
Exhibit Hall Happy Hour
North and South Halls

2:30 - 3:30 p.m.
Science and Education Sessions

3 - 4 p.m.
Italy Presents
Radiology in the Next Generation EU Plan (E350)

3 - 4 p.m.
R&E Foundation Seminar
Planning for Your Future: How to Minimize Taxes and Create Your Legacy (S405)

View the full program and add sessions to My Agenda on the RSNA 2023 App or at *Meeting.RSNA.org*.

DailyBulletin

The RSNA 2023 *Daily Bulletin* is the official publication of the 109th Scientific Assembly and Annual Meeting of the Radiological Society of North America. Published Sunday, November 26–Thursday, November 30.

The RSNA 2023 *Daily Bulletin* is owned and published by the Radiological Society of North America, Inc., 820 Jorie Blvd., Suite 200, Oak Brook, IL 60523.

Support the Future of Radiology on #GivingTuesday

The R&E Foundation is participating in #GivingTuesday, a day dedicated to global philanthropy and altruism.

The #GivingTuesday movement sparks a spirit of generosity and encourages you to contribute to charitable initiatives aligned with your personal values. Why not celebrate the radiology community on #GivingTuesday by making a donation to the R&E Foundation?

Since its inception in 1984, the Foundation has awarded $78 million in funding for over 1,800 grant projects. Foundation grants improve disease detection and management by providing protected time for research, spurring professional exposure and career growth, and opening doors to additional funding sources.

Whether you're interested in donating as an individual, part of a practice or on a corporate level, the Foundation offers giving options that will have a lasting impact on the future of the field and inspire promising researchers and educators.

Spark discovery in radiology by making a gift at *RSNA.org/Donate* or by visiting the R&E Foundation Booth in the Connections Center. Share your support across social media using #GivingTuesday and #RSNA23.

Physics Tip

American Association of Physicists in Medicine

Motion artifact in MR can be mitigated using propeller or blade sequences which oversample center of k-space and use that to compensate for motion.

Don't Miss Tonight's Exhibit Hall Happy Hour

Join RSNA 2023 exhibitors on Tuesday, Nov. 28, for Exhibit Hall Happy Hour.

During this free event, participating exhibitors will be serving appetizers, alcoholic beverages and other refreshments from 2 to 5 p.m. at their respective booths. Don't miss the fun including live music and giant Jenga and Connect Four games.

HAPPY HOUR

Enjoy this opportunity to connect with industry influencers, colleagues and friends in a relaxed and social atmosphere.

Spend the rest of your time in the Technical Exhibits Halls, engaging with industry experts and exploring the wide array of medical imaging industry presentations, product demonstrations, workshops and symposiums at the RSNA 2023 Technical Exhibits.

With more than 650 leading manufacturers, suppliers and medical information and technology developers on hand, you will be immersed in medical imaging innovation.

Technical Exhibit Hours

Sunday–Wednesday . . . . . 10:00 a.m.–5:00 p.m

South Hall A, Level 3
(Booths 1000–5900)

North Hall B, Level 3
(Booths 6000–8599)

Contrast-Enhanced Mammography May Be an Option for Personalized Cancer Screening

By Evonne Acevedo

For breast screening programs with limited access to MR imaging, or for patients who prefer to not undergo MR screening, contrast-enhanced mammography (CEM) could offer a low-cost alternative with similar cancer detection rates.

Berg

There is increasing interest in personalized screening based on breast density and risk, said Wendie A. Berg, MD, PhD, who serves as Distinguished Professor of Radiology and The Bernard F. Fisher Chair for Breast Cancer Clinical Science at the University of Pittsburgh School of Medicine and Magee-Womens Hospital in Pennsylvania. She presented results from her team's study, "Screening Contrast-Enhanced Mammography as an Alternative to MRI (SCEMAM)," in a Monday scientific session.

By September 2024, all women in U.S. screening programs are to receive communications telling them whether their breasts are dense or not dense. "Twenty states, including Pennsylvania, currently have laws requiring insurance coverage for supplemental MR screening in women with dense breasts—usually with other risk factors," Dr. Berg explained. "But there is limited capacity for screening MR imaging."

As part of the SCEMAM study, funded by the Pennsylvania Breast Cancer Coalition, Dr. Berg and her team examined the feasibility of adding screening CEM to tomosynthesis in women who would qualify for MR screening.

"Our study showed added detection of six cancers in 601 women," Dr. Berg said. "This is very similar to the added cancer detection rate of abbreviated MR imaging found in the ECOG-ACRIN 1141 trial."

The cancers they found were mostly small, invasive cancers with a median size of 0.7 cm, all node-negative, and three were invasive lobular cancer.

False-positive recalls from CEM occurred in 13% of the participants—a rather high rate, Dr. Berg noted, that is likely attributable to the technique's additional background enhancement. Two women had DCIS-related calcifications that were seen only on low-energy images, but the researchers found no false negatives from CEM alone—with no interval cancers reported.

Recommendations for Implementing CEM Screening

Considering the high potential for false-positive recalls, as well as the added considerations of potential contrast reactions and radiation dose, Dr. Berg offered recommendations for imaging centers looking to employ CEM in their screening programs.

"The good sides to CEM include use of current equipment, familiar positioning, the low cost of the contrast and excellent cancer detection that is similar to that of MR imaging," Dr. Berg said. "We and others have found strong patient preference for CEM over MR." She noted that, for example, during the American College of Radiology Imaging Network (ACRIN) 6666 study, among women who were offered MR imaging at no cost, nearly 42% declined it for various reasons—the most prominent being claustrophobia.

CEM does warrant its own consideration for workflow and communication issues, Dr. Berg said, including training needed to set up an intravenous line and manage contrast reactions, as well as ensuring a physician is available to manage adverse reactions.

Dr. Berg further recommended that centers looking to implement CEM screening should have direct CEM-guided biopsy capability, since MR imaging-guided biopsy is not a good option for women who can't tolerate MR. "We developed a case set to train our radiologists in CEM interpretation, but there is still a learning curve and need for more widespread standardized training," Dr. Berg said.

Access the presentation, "Screening Contrast-Enhanced Mammography as an Alternative to MRI (SCEMAM)," (M1-SSBR04-04) on demand at *Meeting.RSNA.org*.

Deep Learning Model Can Provide More Accurate Probability of Breast Cancer Diagnosis

By Melissa Silverberg

For several years, radiologists have been publishing research that points to a major shift coming in breast cancer screening recommendations, one that focuses more on individualized risk assessment supported by AI and deep learning.

In research presented Monday, Christiane Kuhl, MD, director of the Department of Diagnostic and Interventional Radiology at University Hospital Aachen in Germany, discussed leveraging the power of AI to identify breast cancer risk earlier and save lives.


Kuhl

This retrospective, multi-center international study, fielded with Clairity, an international mammography screening consortium and health care venture, included 318,101 consecutive bilateral 2D full field digital screening mammograms obtained from 129,498 patients between January 2007 and December 2016. Patient demographics including age and race/ethnicity were retrieved from electronic medical records and cancer outcomes were obtained from local tumor registries.

Algorithm Offers Five Year Risk Estimate For Breast Cancer

The team developed a deep learning model, Allix5, to predict the development of breast cancer within five years of the mammogram. A calibration algorithm was used to create percent probabilities of future cancer, giving patients more information about their individual risk of developing the disease.

"A deep learning model, trained and calibrated on international mammography screening consortium data resources, based on the screening mammogram alone, provides a high predictive accuracy (AUC of .75-.80) and is well calibrated for use in current standard of care clinical workflows that rely on five-year breast cancer risk predictions," Dr. Kuhl said. "The model can be calibrated and provide five-year risk estimates that offer more personalized screening and risk reduction intervention recommendations."

Traditional risk models based on age alone were developed with datasets based almost exclusively on white women, which leaves out many patients across the globe, according to Contance Lehman, MD, PhD, founder of Clairity.

"Most breast cancers we identify are in women with no known genetic mutation or family history," Dr. Lehman said. "The application of AI is a really promising domain to improve breast cancer risk assessment."

Individual risk assessment, with specific percent probabilities of developing future cancer, sounds like a great advancement, but the hardest transition will be shifting the narrative for the public, according to Dr. Lehman.

"We've always had our screening recommendations by age, so how do we transition to screen by risk? It is always hard to shift paradigms, but what we know is that what we're doing right now with traditional risk modeling is failing the majority of our patients," Dr. Lehman said. "If there was ever a group of physicians in radiology who can bring about change, it is breast imagers."

Clairity is working with the FDA to get approval of its algorithm and Dr. Lehman said she expects the conversation to shift in the next few years about who is at risk and how to understand your personal breast cancer risk with more informed context.

"Breast cancer screening has been a 'one size fits all' approach for the longest time. We now have the tools, such as MRI, to improve screening for women who need it. With AI-based assessment of mammograms, we are now able to identify women in-need for screening beyond mammography," Dr. Kuhl said. "This will be a game changer—and can help potentially eradicate breast cancer as the leading cause of cancer death in women."

Access the presentation, "Performance of a Deep Learning Image Based 5-Year Breast Cancer Risk Model Developed Across Global Imaging Centers That Provides a Percent Probability Output for Use in Existing Clinical Workflows and Decision Making," (M1-SSBR03-6) on demand at *Meeting.RSNA.org*.

> ***"Breast cancer screening has been a 'one size fits all' approach for the longest time. We now have the tools, such as MRI, to improve screening for women who need it. With AI-based assessment of mammograms, we are now able to identify women in-need for screening beyond mammography. This will be a game changer—and can help potentially eradicate breast cancer as the leading cause of cancer death in women."***
>
> **Christiane Kuhl, MD**

Dual-Energy CT Offers Faster Diagnosis of Gallstones

By Lynn Antonopoulos

A technique using dual-energy CT shows promise in gallstone disease imaging and can potentially reduce the need for further gastrointestinal imaging using US or MRI for patients with cholelithiasis or choledocholithiasis.

"Our approach offers faster diagnosis of cholelithiasis or choledocholithiasis without subsequent imaging, thus providing a reduction in imaging costs, shorter time to diagnosis, and lower risk for patients," said Todd C. Soesbe, PhD, an assistant professor in the Department of Radiology at UT Southwestern Medical Center in Dallas.

"Isoattenuating gallstones occur when cholesterol-based gallstones have the same Hounsfield units as the surrounding bile and are therefore difficult to see on CT scans of the gallbladder," Dr. Soesbe said.

Motivated by a suggestion from mentor and study co-author John Leyendecker, MD, Dr. Soesbe and colleagues sought to develop a dual-energy CT method to address this challenge.

To test their hypothesis, the team first made a CT phantom containing a pure cholesterol pellet (to simulate an isoattenuating gallstone) and dehydrated ox-bile (in solution, to simulate human bile).

"We were excited to discover that even though the cholesterol pellet and ox-bile were isoattenuating in the conventional CT image, they appeared in different locations within a 2D histogram made from photoelectric effect and Compton scattering attenuation values," Dr. Soesbe said. "Therefore, cholesterol-based gallstones could be easily differentiated and segmented from bile using our custom methods, allowing them to be easily seen in the CT image."

> ***"Our approach offers faster diagnosis of cholelithiasis or choledocholithiasis without subsequent imaging, thus providing a reduction in imaging costs, shorter time to diagnosis, and lower risk for patients."***
>
> **Todd C. Soesbe, PhD**

For proof of concept, the researchers first performed an ex vivo study, published in *Radiology*, using gallstones collected from cholecystectomy patients and ox-bile.

The researchers have since performed a retrospective in vivo study evaluating CT scans from 20 patients with isoattenuating gallstones and 20 gallstone-free patients. All patients were scanned with dual-energy CT between July 2015 and October 2019.

They confirmed positive and negative stone diagnoses using MR cholangiopancreatography (MRCP), endoscopic retrograde cholangiopancreatography (ERCP) or US performed withing 90 days of CT.

Conventional, 40 keV monoenergetic, and effective-Z series were created for each patient, as well as two custom segmented series using either Compton and photoelectric attenuation data, or denoised 200 and 40 keV monoenergetic data.


Soesbe

Four readers evaluated the presence of isoattenuating stones in each of the five series. Out of the gallstone-positive patients, the types of stones identified were gallbladder stones, cystic duct stones and common bile duct stones.

According to Dr. Soesbe, comparing the 2D histogram of all patients who were gallstone-positive patients to that of those who were gallstone-negative revealed that isoattenuating stones appear in a separate and unique 2D location that permitted material differentiation and visual segmentation of isoattenuating stones within the conventional CT series. For all patients, the Compton/photoelectric or denoised monoenergetic series provided the highest agreements and overall diagnostic performance.

"The retrospective in vivo study results, which we present here, required hours and hours of customized image analysis and radiologist readings, but our team efforts were well worth it," Dr. Soesbe said. "The vendor-neutral aspects of our improved in vivo method have the potential to make dual-energy CT the reference standard to evaluate gallstone disease."

Access the presentation, "A Technique to Identify Isoattenuating Gallstones With Dual-Energy CT: An In Vivo Study," (M3-SSGI05-06) on demand at *Meeting.RSNA.org*.

Physics Quiz

American Association of Physicists in Medicine

Q How does fat in fast/turbo spin echo imaging compare to fat in conventional spin echo imaging?

[Answer on page 9.]

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Three Key Concepts to Solve Workplace Challenges

ALARA *Design*

Lean *Design*

Sustainable *Design*

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Our Booth → South Hall #1334

At the Shimadzu booth, you will see our product folio on display.
In addition, you can discover our newest approaches
like "Advanced Healthcare" at our booth. We all look forward
to welcoming you at our booth in Chicago.

Lunch and Learn seminar

Date & Time	Nov. 28(Tue) 12:00PM-1:00PM
Place	South Hall, Level 5, Room S501
Title	Advanced techniques and technologies for Interventional procedures in Medical imaging

RSVP is required

RSNA Recognizes Honorary Members, Outstanding Educator and Outstanding Researcher

During RSNA 2023, RSNA presented awards for significant achievement in the field of radiology

Honorary Members


Al-Kutoubi


Beets-Tan


Chou


DiSantis


Wood

Aghiad Al-Kutoubi, MD

A champion of advancing interventional radiology throughout the Middle East and the world, Aghiad Al-Kutoubi, MD, earned his stripes during the golden era of vascular imaging, and he has lent his legacy to multiple generations of trainees.

Dr. Al-Kutoubi earned his medical degree from Damascus University and then moved to the United Kingdom for his post-graduate training. At St. Mary's Hospital at the University of London—now part of Imperial College—Dr. Al-Kutoubi trained under international forerunners in the field and was part of the team led by David Sutton, MD, that performed the first balloon angioplasty at St. Mary's. In 1984, the institution appointed Dr. Al-Kutoubi as a consultant radiologist overseeing interventional radiology and CT, as well as the MR imaging unit. Later, he moved to the American University of Beirut Medical Center (AUBMC) in Lebanon to chair its Department of Radiology, revamp its services and training program to align with international standards, and evolve interventional radiology practices throughout the region.

At AUBMC, Dr. Al-Kutoubi collaborated with colleagues to develop a world-class comprehensive IR program, revolutionizing the AUBMC radiology department and fortifying its physician workforce.

Dr. Al-Kutoubi became renowned for introducing endovascular aneurysm repair for the first time in the Arab Middle East.

A committed educator, Dr. Al-Kutoubi was a founding member of the Arab Board of Radiology and Medical Imaging and the founding president of the Pan Arab Interventional Radiology Society.

Dr. Al-Kutoubi now serves as an adjunct professor of radiology at AUBMC, having served as full professor and head of the interventional radiology division for over 20 years. He has contributed to more than 155 peer-reviewed publications and eight book chapters, and he co-edited the book *Procedural Dictations in Image-Guided Intervention: Non-Vascular, Vascular and Neuro Interventions.*

Regina G.H. Beets-Tan, MD, PhD

A world-renowned leader in cancer imaging and its applications for data-driven treatment guidance, Regina G.H. Beets-Tan, MD, PhD, chairs the Department of Radiology at The Netherlands Cancer Institute in Amsterdam.

Dr. Beets-Tan focuses on abdominal and oncological radiology, leading seminal research into improving outcomes in patients with colorectal cancer. At The Netherlands Cancer Institute, she directs research in cancer imaging, investigating multi-parametric and AI imaging technology to guide interventional, surgical and radiation therapies, and as biomarkers for treatment efficacy. She is a professor of radiology at the University of Maastricht, The Netherlands, and adjunct professor of abdominal and oncological radiology at the University of Southern Denmark.

She earned her medical degree, *cum laude*, at Erasmus University Rotterdam in The Netherlands, then pursued advanced training in radiation oncology at the University Hospital Leuven, Belgium, followed by training in radiology at Maastricht University Hospital.

Dr. Beets-Tan's leadership in radiology is exemplified by her completed term in July 2023 as chair of the European Society of Radiology (ESR) board of directors. She served in numerous leadership capacities over the years, including as president of the ESR and of the 2022 European Congress of Radiology. She currently serves as the scientific director for ESR's European Institute for Biomedical Imaging Research.

From 2019 to 2021, Dr. Beets-Tan was president of the European Society of Gastrointestinal and Abdominal Radiology, overseeing its 2020 annual meeting in Amsterdam and its 2021 virtual meeting. In the preceding years, she served as president of the European Society of Oncologic Imaging.

Dr. Beets-Tan contributed to several books including *Imaging and Interventional Radiology for Radiation Oncology* and an undergraduate medical student textbook on the diagnosis and treatment of cancer. She has published more than 430 peer-reviewed articles and has spoken at more than 600 invited lectures.

Yi-Hong Chou, MD

A prolific investigator and insightful mentor, Yi-Hong Chou, MD, is internationally recognized for his research in advanced ultrasound techniques and for his natural leadership in both the clinical and academic arenas.

Dr. Chou is vice president and chair professor of radiology at Yuanpei University of Medical Technology and National Yang Ming Chiao Tung University School of Medicine in Taipei, and a clinical professor at Taipei's National Defense Medical Center. He is director of the Asian Oceanian School of Radiology.

Dr. Chou earned his medical degree from Taipei Medical College and received his postgraduate training in radiology and ultrasound at Veterans General Hospital in Taipei, Mount Sinai Medical Center in New York, and Thomas Jefferson University Medical Center in Philadelphia, PA.

Dr. Chou's research focuses on ultrasound, particularly breast and abdominal applications as well as in the emergency setting. He is currently investigating Doppler techniques and microbubble contrast agents for evaluating tumor vascularity, and tumor ablation techniques. He has authored or co-edited more than 436 peer-reviewed articles, 18 book chapters, five books and nearly 400 abstracts.

A widely respected leader, Dr. Chou has served in many executive roles including as administrative councilor of the International Society of Radiology and vice president 1 of WFUMB. He is a former president of the Asian Oceanian Society of Radiology (AOSR), the Asian Federation of Societies for Ultrasound in Medicine and Biology, the Asian Society of Abdominal Radiology (ASAR) and Asian Breast Diseases Association.

Dr. Chou received gold medals from AOSR and ASAR and holds numerous honorary memberships including from the European Society of Radiology (ESR), the Japanese Radiological Society and the Korean Society of Radiology.

Outstanding Educator

A champion of education for all science-driven learners regardless of background, **David J. DiSantis, MD**, is lauded throughout the radiology community for his exemplary work in teaching, mentorship, and patient care.

Dr. DiSantis' clinical and teaching roles have taken him from Eastern Virginia Medical School to Wake Forest University, the University of Kentucky, and finally to his current position as professor of radiology at the Mayo Clinic College of Medicine and Science in Florida. He is a sought-after advisor for trainees who are contemplating academic medicine. Unsurprisingly, Dr. DiSantis has been honored as Teacher of the Year at Eastern Virginia Medical School, Wake Forest University, and the Mayo Clinic. In addition, he was awarded the first endowed professorship in radiology at the University of Kentucky College of Medicine.

Dr. DiSantis has delivered 11 named and honorary lectureships, among them the Richard H. Marshak International Lectureship of the Society of Abdominal Radiology and the Glenn Hartman Radiology Centennial Oration. In 2021, he received the Lifetime Service Award of the American Board of Radiology.

Dr. DiSantis has been associate editor of *Abdominal Radiology* and serves on the editorial board of *RadioGraphics*. He served on the RSNA Education Committee and has been recognized as an RSNA Honored Educator.

Dr. DiSantis received his medical degree at the University of Pennsylvania School of Medicine and completed his residency in diagnostic radiology and fellowship in abdominal imaging at Washington University School of Medicine's Mallinckrodt Institute of Radiology in St. Louis. In 2003, he earned a master's degree in nonfiction writing from Goucher College in Baltimore.

Dr. DiSantis and his wife, Denise, lead a program designed to encourage grade-school children from underrepresented populations to pursue careers in science and technology called "You can do STEM!", which earned him the inaugural Diversity, Equity, and Inclusion Achievement Award of the Society of Abdominal Radiology.

Outstanding Researcher

A trailblazer of interventional approaches to deliver lifesaving treatments to patients with cancer, **Bradford J. Wood, MD**, exemplifies the character of a translational scientist who applies investigative techniques to real-world clinical practice.

Dr. Wood is the founding director of the NIH Center for Interventional Oncology. He also serves as chief of Interventional Radiology at the NIH Clinical Center, and he holds appointments in NCI, NIBIB, as well the University of Maryland as adjunct professor of Biomedical Engineering.

His team pioneered the first and "first-in-human" applications for technologies including first percutaneous RFA for monotherapy of kidney cancer, pheochromocytoma, and adrenal cancer, MR/transrectal ultrasound fusion biopsy and ablation for prostate cancer, image-able drug-eluting beads for chemoembolization of cancer, electromagnetic tracking for fusion of ultrasound to CT, MR and PET for biopsy and ablation, prostate interventions totally outside of the rectum, as well as the first ablation or embolization with checkpoint inhibition for immunomodulation in hepatocellular cancer.

Dr. Wood earned his medical degree in 1991 from the University of Virginia in Charlottesville, and completed fellowships at Massachusetts General Hospital (MGH) and Harvard Medical School, in Boston. He held clinical and teaching positions at MGH/Harvard and Georgetown University in Washington, DC, before he was recruited to NIH. From 2006 to 2008, he served as acting co-chief of Radiology and acting director of Molecular Imaging.

Dr. Wood's multidisciplinary investigative teams have developed technologies and techniques that improve outcomes for patients with cancer and other conditions. Dr. Wood has overseen the authorship of several books and more than 600 peer-reviewed manuscripts. He holds more than 50 patents for advanced systems and techniques to target disease. His papers have been cited over 40,000 times, with an H-Index of 102.

Dr. Wood has received the NIH Director's Award, NIH Clinical Center Director's Award, NIH CC CEO Award, NIH Bench to Bedside Award, NIH Director's Honor Award, and the NCI Research Award. He has mentored scores of outstanding physicians, who have in turn gone on to hold professorships, patents and research endowments.

RSNA Keeps Pace With Every Step of Your Career

We love recognition! Members proudly wear ribbons recognizing career achievements and the myriad ways they support the radiology community.

Running into old friends and meeting new ones is one of the many benefits of the annual meeting.

RSNA 2023 award recipients were recognized at a special luncheon in their honor. From left to right, Gold Medalists, Anne C. Roberts, MD, Valerie P. Jackson, MD, and Joseph K.T. Lee, MD; Honorary Members, Aghiad Al-Kutoubi, MD, Regina G.H. Beets-Tan, MD, PhD, and Yi-Hong Chou, MD; RSNA President Matthew A. Mauro, MD; Outstanding Researcher, Bradford J. Wood, MD; Outstanding Educator, David J. DiSantis, MD; and Margulis Award recipients Ting-Hui Wu, MS, and Po-Ting Chen, MD.

After participating in some of the fun socializing activities in the Residents Lounge, trainees can regroup before heading out to attend more sessions.

The Residents Lounge is a great place for trainees to relax, network and explore early career development topics.

Demonstrating How Transparency in AI Can Support Research and Clinical Practice

By Nick Klenske

The lack of transparency in radiologic research that uses AI datasets and source code is one reason that some radiologists are slightly distrustful of AI.

During a Monday session, Eline Langius, MD, a radiology resident and PhD candidate at Isala Hospital in the Netherlands, discussed the effect of this distrust on radiology research and in clinical practice.

"When we use AI in clinical practice, there's usually little transparency, meaning we don't exactly know what the algorithm looks like, whether the version we get to use is the same as the one used in the most recent study or what exactly the algorithms are trained on. A general lack of trust in AI is a major barrier to its widespread implementation in radiology."

Eline Langius, MD

"When we use AI in clinical practice, there's usually little transparency, meaning we don't exactly know what the algorithm looks like, whether the version we get to use is the same as the one used in the most recent study or what exactly the algorithms are trained on," Dr. Langius explained. "A general lack of trust in AI is a major barrier to its widespread implementation in radiology."

Confident this barrier could be overcome through open access, Dr. Langius led a study evaluating the diagnostic performance and generalizability of the winning deep learning (DL) algorithm of the RSNA 2020 Pulmonary Embolism Detection Challenge.

Published Source Code Enables Research

The RSNA Challenge, which invited researchers to develop machine-learning algorithms to detect and characterize instances of pulmonary embolism on chest CT studies, was unique in that it required competitors to publish their source code.

"This allowed the fog to lift as we were able to see the algorithm, how it worked and, perhaps most importantly, what it worked on," Dr. Langius explained.

With this information in hand, researchers retrained the winning algorithm on the RSNA-STR Pulmonary Embolism CT (RSPECT) dataset. The retrained algorithm was tested at Isala Hospital on multidetector CT (MDCT) images and on spectral detector CT (SDCT) and virtual monochromatic images at the University Medical Center Utrecht, Netherlands.

The output was compared with a reference standard, which included a consensus reading by at least two experienced cardiothoracic radiologists.

Langius

What researchers found was that the retrained algorithm showed high diagnostic accuracy on MDCT images with an AUC of 0.96. However, a somewhat lower performance was observed on SDCT images, suggesting that additional training on more advanced CT technology could improve the generalizability of the algorithm.

But perhaps the study's biggest takeaway was the benefits of transparency and open access.

"We were able to obtain this information because of the transparency of the RSNA RSPECT CTPA dataset and the source code of the DL algorithm, both of which are not typically available to radiologists using commercial AI products in the clinical setting," Dr. Langius said.

The Benefits of Transparency and Open Access

According to Dr. Langius, when a radiologist knows how an algorithm is designed, how it works and how it was trained, they will feel more confident in using it.

Another benefit of having access to an algorithm's source code is that it can be trained on local CT pulmonary angiogram data, meaning its diagnostic accuracy can be optimized on specific protocols and scan techniques.

"Reporting large scale results of open access DL algorithms also has the potential to encourage the innovation, competition and collaboration we need to drive developments in this exciting field," Dr. Langius concluded.

Access the presentation, "External Validation of a Deep Learning-Based Model to Detect Pulmonary Embolism on CTPA," (M3-SSCH03-1) on demand at *Meeting.RSNA.org*.

Creation and Impact of a Multidisciplinary Green Radiology Leadership Team

By Mary Henderson

The journey to create a multidisciplinary green radiology leadership team was the topic of a Monday morning session.

Hayley Panet, MHSc, senior manager for medical imaging at Toronto Western Hospital in Ontario, shared her health network's approach to form a multidisciplinary leadership committee that was focused on sustainability.

"We really want to engage staff to be green radiology champions, advocates, and ambassadors to help lead and sustain the changes we make."

Hayley Panet, MHSc

"Health care contributes over 5% of total global greenhouse gas (GHG) emissions—and medical imaging departments are one of the largest contributors," Panet said. "I hope to provide a roadmap for forming a green radiology program at any institution, the hospital department roles and committee participants to include, and an example of strategic goals and activities."

Seeking Input From All Levels Of Care

With approval from department executives, the hospital established a co-chair model with a radiologist and hospital administrator to lead the green radiology initiative.

The committee includes members of the medical imaging team and hospital leadership, as well as other key players across the organization, including members of medical imaging, business intelligence, biomedical engineering, environmental and building services.

"We identified experts from across hospital roles and departments to form our multidisciplinary leadership team," she said.

As a guide, the committee utilized the special report on climate change and radiology published in *Radiology* by co-author Kate Hanneman, MD, MPH, a cardiac radiologist and deputy lead for sustainability at University Medical Imaging Toronto.

Part of the committee's strategy involves partnering with front-line teams who must execute on and support initiatives on a day-to-day basis. Panet said she hopes this shared accountability model will inspire team members to think about changes that can be made in their own niche areas.

"We really want to engage staff to be green radiology champions, advocates and ambassadors to help lead and sustain the changes we make," she said.

Sustainability Without Compromising Care

To begin assessing the hospital's impact on GHG emissions and waste, the committee established and prioritized goals and activities, beginning with data collection and annual goals to capture, track and quantify the impact of changes.

"We needed to determine what and how to measure across our fleet of scanners to determine a baseline measurement," Panet said. "This requires a financial investment as well as careful planning to ensure there are no interruptions to patient care."

The committee's second goal involved identifying activities and opportunities to reduce waste, especially single-use consumables.

Panet acknowledged that maintaining the momentum of green radiology initiatives can be challenging.

"I really hope that the work we're doing implementing changes within our healthcare system will provide a blueprint for other green radiology groups," she said. "We plan to continue sharing our learnings to inspire others."

Panet

Access the presentation, "Creation and Impact of a Multidisciplinary Green Radiology Leadership Team," (M3-STCE1-3) on demand at *Meeting.RSNA.org*.

DL Models Show Bias in Knee Osteoarthritis Diagnosis

By Richard Dargan

Deep learning (DL) models are able to diagnose knee osteoarthritis with high accuracy, but can also exhibit biases based on sex and, to a lesser extent, race, according to a digital poster.

While AI has shown the potential to transform medical imaging, bias can be built into the models. Previous research has shown that DL models for chest X-ray diagnosis demonstrate biases against historically disadvantaged groups across sex and race, raising concerns about the equitable use of these tools.

"Ultimately, understanding the mechanisms behind these demographic biases will lead to the development of more transparent and unbiased AI models in radiology."

Bardia Khosravi MD, MPH

It is unclear, however, if similar biases exist for DL models in other body parts like the knee.

To find out more, researchers led by Bardia Khosravi MD, MPH, from the Mayo Clinic in Rochester, MN, used the publicly available Osteoarthritis Initiative (OAI) dataset of knee radiographs to develop and test a DL model. They first trained a model to localize the right and left knees and then used it to test for knee osteoarthritis severity based on the Kellgren-Lawrence Grading (KLG) system, a common method that grades osteoarthritis severity on a scale of 0 to 4.

Overall, the DL osteoarthritis severity grading model performed at a state-of-the-art level. However, subgroup analysis showed biases favoring males in four of five KLG categories, echoing previous findings in DL models for chest X-ray diagnosis.

"Across all groups, we see that there was not much difference in the average performance, but when we dug into the subgroups, we found some huge differences," Dr. Khosravi said. "For example, the model showed significantly better performance in a subgroup of KLG 1 males. These models are preferring one group over the other, but this is not consistent."

Racial Bias Less Evident Than Sex Bias

The performance gap between racial groups was much lower, with no difference between white and non-white patients for KLG 0 and 2, and only slight differences for KLG categories 1, 3, and 4. This finding suggests that demographic-based biases in DL models may vary between specific diagnostic use cases, Dr. Khosravi said.

The model's better performance overall for males over females was not directly related to the population size; in fact, the datasets included considerably more females than males.

Khosravi

"The distribution of features, not the representation, is the main problem," Dr. Khosravi said. "When we plotted the distribution of the model features for different race and sex groups, we saw that those groups that have the wider distribution of features will have lower performance."

Dr. Khosravi is presenting a similar study on Tuesday that examines the ability of generative DL models to aid in detecting previously unrecognized anatomical differences between races in medical imaging datasets. He plans to assess the data from the two studies to learn more about the different features that the DL models are recognizing.

"Ultimately, understanding the mechanisms behind these demographic biases will lead to the development of more transparent and unbiased AI models in radiology," Dr. Khosravi said.

Access the presentation, "Knee Osteoarthritis Deep Learning Models Demonstrate Greater Biases Based on Sex Than Race," (T5B-SPIN) on demand at *Meeting.RSNA.org*.

Answer

American Association of Physicists in Medicine

A

[Question on page 4.]

Brighter. In conventional spin echo, the protons in fat dephase a bit due to their influence on each other (called J-coupling). In fast/turbo spin echo the rapid successive 180-degree pulses break the coupling and thus the dephasing.

Information Blocking Provision Represents Opportunity for Radiologists

By Richard Dargan

A provision of the Cures Act that allows patients timely access to their electronic medical information—in some cases before their physicians—represents both a challenge and an opportunity for radiologists, according to presenters at a Monday debate session.

Signed into U.S. law in 2016, the 21st Century Cures Act was created to help speed innovation in medicine. The compliance phase began in 2021.

"Although this law was in the works since 2016, it caught many organizations off guard," said session moderator Jennifer Kemp, MD, radiologist and quality chair at Diversified Radiology in Denver. "Many people were ill-prepared or illiterate regarding what this new rule meant or how to deal with it."

The provision means that imaging results are no longer subject to any unofficial embargo until the primary care or emergency physician can talk with the patient. Patients appear to strongly support the move. A study co-authored by presenter C.T. Lin, MD, professor at the University of Colorado Medical School and chief medical information officer at UC Health, found that 96% of patients preferred seeing their results immediately. Of patients with abnormal results, 94% preferred immediate release of results.

"Most people are very comfortable Googling their results and then waiting to talk with their clinician," Dr. Lin said.

This desire is increasing the urgency for more structured, standardized reporting that will allow radiologists to include pertinent information for physicians while making the reports more digestible for patients.

"We need to be aware that we're writing for two audiences: the doctor and the patient," said Jonathan Mezrich, MD, JD, MBA, LLM, associate professor at Yale University School of Medicine in New Haven, CT. "We don't want to lose the information but we do have to be sensitive to the jargon and acronyms we use."

Researchers are already studying the potential of large language models like OpenAI's ChatGPT to serve this purpose.

"Early work shows that when you place a report into ChatGPT and ask for a summary at a certain grade level, it does a pretty good job," said Arun Krishnaraj, MD, MPH, vice chair of Quality and Safety and chief of Abdominal Imaging at the University of Virginia. "It's not perfect, but it will continue to evolve and get better and will probably be here sooner than we expect."

(Left to right) Krishnaraj, Lin, Mezrich and Kemp

Perhaps the biggest concern over the provision among radiologists is the fear that it will increase patient anxiety and confusion and lead them to misinterpret information. These fears have spurred a movement toward anticipatory guidance, in which discussions about the range of results and the notification process are moved upstream to the time of ordering and questions are solicited from patients in advance of the results.

"Anticipatory guidance means no result is surprising to any of my patients," Dr. Lin said.

To further emphasize his point, Dr. Lin took out a ukulele and serenaded the audience with a clever reworking of the Elton John classic, "Rocket Man."

"And some results patients won't understand," he sang. "Anticipatory guidance is our plan."

Access the presentation, "21st Century Cures Act Information Blocking Provision: Friend or Foe?," (M4-CNPM05) on demand at *Meeting.RSNA.org*.

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AI and Human Collaboration Can Help Create More Transparent, Egalitarian Leadership Environments

Ninety-three percent of respondents said they were optimistic about AI in general, while 86% were optimistic about generative AI. Asked to rank the importance of various AI applications, the chairs unanimously identified quality and efficiency as "very important" or "extremely important," and a similar number found it "extremely important" to address burnout. Lower in the rankings were salaries, cost and education, but more than half of respondents said that equity was important or extremely important.

"I laid these factors out on a spectrum of 'tame problem' versus 'wicked problem,'" Dr. Burnside said, placing quality/efficiency at the tame end and equity at the wicked end. "So kudos to chairs who are making sure our AI algorithms consider equity."

She then mapped out a representation of applications according to their place on the imaging chain—pre-order, order, pre-imaging, acquisition, post-processing, interpretation workflow, care coordination and downstream workflows. A clear pattern emerged, with respondents prioritizing post-processing, interpretation and acquisition, respectively.

"We must pay attention to all aspects of the imaging chain, as well as to existing governance structures," Dr. Burnside said. "We'll need a holistic approach to develop a framework designed to maintain a culture of stakeholder empowerment, collaboration and continuous learning."

Access the plenary session, "Leading Through Technology: Valuing Artificial and Human Intelligence," (M4-PL02), which includes additional results from the new survey, on demand at *Meeting.RSNA.org*.

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Mahmood is Board Chair

A member of RSNA since 1997, Dr. Mahmood has served on numerous RSNA committees including the Annual Meeting Program Planning Committee, Committee on Scientific Affairs, Molecular Imaging Committee, Research Development Committee, and multiple RSNA journal editor search committees. He has served as chair for the RSNA Finance Committee, Grant Program Committee, Board Committee on International Affairs, and Molecular Imaging Scientific Abstract and Educational Exhibit Review Committees. He has served as associate editor and consultant to the editor for the journal *Radiology*.

Starting in 2016, Dr. Mahmood served six years on the RSNA Research and Education (R&E) Foundation Board of Trustees, which annually funds more than $4 million in radiology research and education to grow the next generation of radiologists and ensure continued innovation in the field. He has served on the RSNA Board of Directors since 2017 as the RSNA Board liaison for international affairs, helping foster best practices and collaboration globally in radiology.

Dr. Mahmood's primary research interest over the last 30 years has been in molecular imaging and its application to guide precision medicine. He has authored more than 180 peer-reviewed research manuscripts and numerous reviews, chapters and editorials. He has been an invited presenter or course instructor at more than 130 regional, national and international meetings, seminars and conferences. He has been a principal investigator for numerous projects funded by the National Institutes of Health (NIH) that have used nuclear medicine and optical imaging techniques to advance translational efforts to better understand drivers of cancer, including the tumor microenvironment, cancer signaling pathways, changes in cancer metabolism and the interaction of the immune system with tumors.

Dr. Mahmood is a Fellow of the American College of Radiology and Fellow of the Society of Nuclear Medicine and Molecular Imaging (SNMMI). He is an Honorary Member of the Italian Society of Medical and Interventional Radiology and an adjunct professor at the Medical University of Vienna in Austria. Dr. Mahmood received the SNMMI's first Minoshima-Pappas Transformative Leadership Award and received the Distinguished Investigator award from the Academy for Radiology and Biomedical Imaging Research (The Academy).

Dr. Mahmood served for four years as chair of the Board of Scientific Counselors of the Clinical Center of the NIH. He served on the Board of Directors of SNMMI and as chair of the SNMMI Scientific Program Committee. Dr. Mahmood also serves on the Board of Directors of The Academy and on the Executive Committee of the International Society of Radiology.

During his career, Dr. Mahmood has had a longstanding commitment to growing the next generation of clinical radiologists and physician scientists. Trainees have come from around the world and from diverse backgrounds and experiences. He has directly guided more than 100 research mentees, many who have gone on to become academic medical faculty at top institutions globally.

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