

Radiologists seek to explore, invent and transform at RSNA 2017

Mary Beth Massat

As radiologists converge on Chicago for the 103rd Scientific Assembly and Annual Meeting of the Radiological Society of North America (RSNA), they will be greeted by this year's theme: Explore. Invent. Transform.

According to the RSNA 2017 meeting home page, the theme "invites attendees to investigate and advance radiology through innovation as a means of creating positive impact on patient care."¹ Richard L. Ehman, MD, President of RSNA and Professor of Radiology and Consultant in the Department of Radiology and Department of Physiology & Biomedical Engineering at the Mayo Clinic (Rochester, MN), will deliver the opening Plenary Session, "Is it Time to Reinvent Radiology?"

We asked Dr. Ehman and several other leading radiologists to share their perspective on several questions related to the theme: What explorations should radiology undertake? How can radiology invent and innovate to maximize its value? And where should radiologists transform their practice to best serve patients and referring clinicians?

Besides Dr. Ehman, our subjects included Kimberly E. Applegate, MD, MS, FACR, Division Chief, Pediatric Radiology at the University of Kentucky Healthcare; Geraldine McGinty, MD, MBA, FACR, Vice Chair of the American

College of Radiology Board of Chancellors; and Eliot Siegel, MD, Professor of Diagnostic Radiology and Nuclear Medicine, and Vice Chair of Research Information Systems, at the University of Maryland School, and Chief of Radiology and Nuclear Medicine for the Veterans Affairs Maryland Healthcare System.

Explore

Dr. Ehman believes a typical characteristic of explorers in radiology is that they are motivated by practical problems. There remain many unaddressed challenges in diagnostic and interventional radiology where innovation can help provide better care to patients.

"Research is crucial to the future of radiology," Dr. Ehman says. "Major discoveries that have advanced our field have often been accomplished by unique teams with expertise beyond biomedicine including, especially, physics, mathematics and engineering."

Radiologists should re-imagine who and what radiologists are—they are more than just interpreters of images sitting in a darkroom, says Dr. Applegate. She believes that artificial intelligence (AI) and machine learning will be significant forces that they need to understand and embrace now.

"I think of AI as an enhancement and radiology will need to determine how we can best interface and benefit from this technology," she adds. "We are more ready than most in medicine to translate

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Richard L. Ehman, MD, President of RSNA and Professor of Radiology and Consultant in the Department of Radiology and Department of Physiology & Biomedical Engineering at the Mayo Clinic

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technology, its benefits and its limitations to our colleagues and our patients. However, it means that at least some radiologists cannot expect to simply sit in a darkroom and read imaging studies. They must also figure out how to have patients consider them to be one of the specialties they turn to when needed to understand when to use imaging technology and what it can and cannot tell us about health status.”

She sees a similar sentiment to AI as when computer-aided detection (CAD) was first introduced. Education is key to enabling radiologists to learn new technology, when it is appropriate to apply it to a particular disease and then to reports that remove any uncertainty. Dr. Applegate envisions lung cancer screening as one area where AI could help augment radiologists’ knowledge.

“I’m a believer in the incredible, untapped potential of our brain’s ability to build technologies to improve our understanding of the world all around us, including medicine,” she adds.

Dr. McGinty, who sees herself as an explorer, also believes that AI and machine learning will augment the work of radiologists. “We need to understand how these technologies can support radiology in the accuracy of diagnosis but also help manage our workload and amplify the reach of what we do,” she says, pointing out that there are regions of the world that are dealing with shortages of radiologists, or where radiologists don’t have the time to interact with referring clinicians and patients. And, she adds, it is possible machine learning can help improve the work

environment so radiologists feel more supported and satisfied—with less burnout.

“Through the ACR’s Imaging 3.0 and Radiology Cares initiatives, we are encouraging the radiology community to tap into social interactions with patients and clinicians,” Dr. McGinty says, noting these initiatives are also seeking to effect change through policy and reimbursement to further these type of interactions.

As a breast imager, Dr. McGinty is accustomed to speaking with patients. Although MQSA mandates that radiologists speak with patients who have suspicious lesions that require biopsy, she sees it as also just practicing good medicine.

“We see population health as an area where radiologists should have a significant role,” she adds. Lung cancer screening is an example where a radiologist can support the decision-making process with primary care physicians. Dr. McGinty believes radiologists can assume a greater role in screening the population than they have in the past.

Continuous exploration of where radiology should be and thinking about the future has been a passion of Dr. Siegel’s throughout his career. He recalls when his facility was the world’s first to go filmless 25 years ago, the goal was to have images available anywhere and anytime. Today, however, it is clear there are significant benefits that can be achieved with digital data.

“We have been experiencing the advantages of improved access and efficiency that digital imaging provides and are now on the cusp of

RSNA 2017



Kimberly E. Applegate, MD, MS, FACR, Division Chief, Pediatric Radiology at the University of Kentucky Healthcare

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being able to leverage the incredible power of computer vision and quantitative analysis to improve detection, diagnosis and staging of disease, Dr. Siegel explains. “Major breakthroughs are being made in applying machine learning not only to detection and diagnosis of medical images, but also to enhance image acquisition and to improve communication, efficiency, and patient safety. But we’ve only just scratched the surface thus far.”

Dr. Siegel adds that radiology is on a “second interesting wave” of discovery, and he believes AI will be one of the most significant explorations in the upcoming year. Machine learning and AI, he says, have the potential to make radiologists more accurate, consistent, efficient and relevant in the healthcare system.

“If we can process more complex data, the relationship between imaging and outcomes becomes stronger and healthcare will rely more on radiology,” Dr. Siegel says.

He predicts a rebirth of screening and surveillance studies in radiology, especially in areas where screening is currently underutilized, such as lung cancer. Carotid, abdominal aortic aneurysms, and CT colonoscopy are other areas where Dr. Siegel believes screening and surveillance are underutilized. Not only can AI help make these screening studies more efficient, predictable and repeatable, but it can also help encourage more use in the appropriate patient demographics.

“AI will be a tool that allows radiologists to expand our horizons rather than replace us,” Dr. Siegel says.

Invent

Celebrating the process of invention, which propelled the founding of radiology in the first place, is why RSNA included “invent” in its theme. Over the past few decades, Dr. Ehman has witnessed how inventions have provided new capabilities that continue to revolutionize patient care.

“Recent studies have shown that investments in imaging research have an extraordinarily high rate of return, in terms of inventions and their impact, compared with most other areas of biomedical research,” he says. “Innovations in radiology are often translated to patient care much more rapidly than in other fields of medicine.”

Yet, Dr. Ehman points out that less than 2% of NIH grant funding at academic institutions is invested in research within radiology departments—in spite of the high impact of advances in medical imaging.

“The most important action that the radiology community can take to promote further invention and innovation for the benefit of our patients is to address this imbalance,” he says.

Dr. McGinty agrees that radiology has been on the forefront of invention and innovation. “That’s in our DNA. Most of us are using tools today that didn’t exist when we trained, and we had an electronic medical record before many other specialties. I don’t think we need to do anything different, but maybe just tell our story better,” she says.

Part of telling that story better may include a greater focus on team-based care, something Dr. McGinty says radiology should transition toward. Being visible to the patient and letting



Geraldine McGinty, MD, MBA, FACR, Vice Chair of the American College of Radiology Board of Chancellors

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them know they can call and ask questions or encouraging referring physicians to tap into a radiologist’s expertise to collaborate on a difficult case are two examples she shares. In fact, Dr. McGinty says that Massachusetts General Hospital is piloting a system where primary care physicians can conduct a virtual visit with the radiologist to discuss imaging results while in consultation with a patient.

“The highest compliment we can get is for a patient to call us their doctor,” Dr. McGinty adds.

One of the major shortcomings that Dr. Siegel sees in radiology is communicating to referring physicians a recommendation for a patient to undergo follow-up or additional testing. The ACR created a communication standard for critical or urgent findings, but that’s only a limited subset of cases that radiologists read and report. Dr. Siegel says the issue remains that there is no tracking mechanism similar to what is used in mammography screening to ensure a patient has had the recommended follow-up study.

“What we see in breast imaging applies to other areas within diagnostic imaging,” Dr. Siegel explains. “It may be labor intensive to meticulously structure reports and document follow up for mammography screening, but it improves care and minimizes cases where the patient doesn’t get the appropriate follow-up care. We should have a greater expectation for radiologists to do their own communication and patient follow-up in all specialties.”

Another area where the addition of a tracking mechanism or machine learning would be helpful is the clinical usefulness of a particular study.

Dr. Siegel explains that radiologists often don’t receive feedback on studies that fall outside the norm. Did the study meet the referring physician’s expectations? Did it provide the information needed for patient care?

The quality of an imaging study and patient safety are two areas where Dr. Applegate sees the prospect to innovate and invent—as well as the opportunity to collaborate locally and globally.

“We need to capitalize more on image knowledge and shared expertise,” she says. There are opportunities for collaboration on international studies and guidelines, similar to the harmonization that occurred between the EANM and SNMMI regarding pediatric weight-based dose guidelines for nuclear medicine exams. Partnering across multiple specialties and organizations was also instrumental in the development of the Image Gently campaigns, Dr. Applegate adds.

“Look beyond the immediate impact of an imaging test result. Sometimes the role of imaging is not readily apparent for months to years afterward. Individually we aren’t equipped within our own institutions to track these sorts of outcomes in the long-term or for chronic diseases such as cancer, multiple sclerosis or Crohn’s disease,” Dr. Applegate says. Partnering with multiple sites to enlarge sample size and sharing expertise doesn’t need to stop at the academic institution. Rather, it can continue with non-profit, patient-focused foundations.

Transform

Transforming radiology to best serve patients and referring physicians will require a heightened

RSNA 2017



Eliot Siegel, MD, Professor of Diagnostic Radiology and Nuclear Medicine, and Vice Chair of Research Information Systems, at the University of Maryland School, and Chief of Radiology and Nuclear Medicine for the Veterans Affairs Maryland Healthcare System

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focus on value, Dr. Ehman says. He explains that much of the past innovation in radiology focused on the *numerator* of the value equation by increasing safety and the volume and quality of diagnostic information. Of course, the *denominator* of the equation is cost. While lean engineering methods are useful tools to eliminate waste and reduce cost, a greater opportunity exists.

“There will be even more opportunity if the radiology community deliberately moves to focus its technology innovators and information scientists on relentlessly optimizing *both* the numerator and denominator of the value equation,” Dr. Ehman adds.

Radiologists also need to be proactive in the new U.S. healthcare model that emphasizes keeping a patient healthy as long as possible. While still in transition, the payer model in the U.S. continues to reward patients for waiting until they get sick.

“We need a way to motivate patients to stay healthy and fit,” Dr. Siegel says. “I would love to see radiology transform itself by creating a mechanism that provides feedback to patients on how successful they were, whether that be brain age, the degree of coronary calcification or dozens of other parameters. Catch that patient earlier in the disease process, be an advocate for health by giving them the information they need and provide feedback on the interventions they are doing. That’s where we can and will go in the future.”

Increasing peer-to-peer consultations in an era of computerized physician order entry is an area where Dr. McGinty believes radiology can further

transform. Guidelines can’t answer all the questions, and peer consultation is an area where radiology can showcase value across all specialties.

“We are along that path of transformation by refocusing on the patient at the center of everything we do,” Dr. McGinty says. “Through the ACR’s Data Science Institute, we can focus on what is best for our patients.” Launched in May 2017, the Institute will work with industry, government and others to guide and facilitate the development of AI tools to help radiologists improve medical imaging care.²

Yet, in many ways the transformation of radiology may involve the recognition that medical imaging may not always provide an answer to the clinical question at hand. Dr. Applegate believes that how educators train the next generation of radiologists to understand the value of imaging and the value of no imaging will be a major shift in philosophy of western human health.

“The most important question that radiologists need to ask is not *if* we can do an imaging procedure, but whether we *should* be doing it,” says Dr. Applegate. “We need to be better team players and stewards of very powerful technology, including the when, how and what to order for our referring clinicians. And when we don’t know the answer, we need to image gently.”

References

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