Radiology Must Embrace Innovation

“Star Trek” may seem an unlikely blueprint for radiology’s future, but RSNA president Ronald L. Arenson, M.D., successfully blended the fictional TV program with the realities facing radiology during his President’s Address, “Going Boldly into Radiology’s Technological Future: Why Our Profession Must Embrace Innovation,” on Sunday in the Arie Crown Theater.

By Paul LaTour

While some of you may feel like we are already living in a ‘strange new world,’ the point is that change is upon us,” Dr. Arenson said. “Like Earth in the 23rd Century, our profession has reached a time of great challenge. It’s a time that requires us to be bold explorers and to seek our own version of ‘new life and new civilizations,’ Dr. Arenson said, referencing the TV program’s familiar opening words.

Challenges facing radiology include growing demand for personalized medicine, integrated health care delivery, healthcare payer expectations, massive expansion of data and the growth of telehealth, and an aging population.

“Radiology is going to be in great demand and we are going to have to be ready. It’s that simple,” Dr. Arenson said. “We have work to do if technology is going to meet its promise for the future — work that requires managing change as much as embracing it.”

Referring back to “Star Trek,” Dr. Arenson illustrated how some of the show’s technological devices were precursors for such things as cellphones, Google Translate and Skype.

Regarding medicine, Dr. Arenson said what was a novelty on the program is becoming reality today. In particular, experimenters at Harvard University and Scanadu, a mobile medical device company, are pursuing a “Star Trek”-like tricorder, which could measure oxygen and detect disease. The company created the Scanadu Scout, a palm-sized scanner that detects a variety of health indices.

Similar technological advances are also coming to radiology. Some examples include a 7-nanometer transistor from IBM that is four times more powerful than previous ones, an ultrafast receive-only 2-D transistor from IBM that is four times more powerful than previous ones, an ultrafast receive-only 2-D

Converting DICOM Images to 3-D Printed Models Critical to Progress

The impact of 3-D printing is so significant that it may become the standard way that doctors “talk to their patients.” However, certain challenges must be overcome before the modality realizes its full potential in radiology and healthcare overall, said a presenter of a Sunday session.

By Felicia Dechter

“3-D PRINTING IS A COMPLETELY DISRUPTIVE technology in general and in medicine,” said Frank Rybicki, M.D., Ph.D., professor and chair of the Department of Radiology at the University of Ottawa Faculty of Medicine. “It will change the way that doctors do procedures. It will change the way we teach young physicians.”

3-D printing refers to the fabrication of graspable objects from digital models. 3-D printing itself depends on the advanced imaging modalities and protocols to generate source DICOM images amenable for printing. And while advanced visualization displays play a role in communicating information to referring clinicians, “there is an unmet need that radiologists need to fulfill to render DICOM images as 3-D printed models capable of providing both tactile feedback and tangible depth information of both anatomic and pathologic states,” Dr. Rybicki said.

“Radiologists are trained to make a diagnosis using ‘routine’ 2-D images such as CT and MRI,” Dr. Rybicki said. “Thus far, we don’t have evidence that 3-D printing changes diagnoses. We hope that the ability to diagnose from 3-D printing will be realized in the future.

“Until now, what radiologists have not been able to do is allow the referring physician—for example the surgeon—to plan the procedure ahead of time with a 3-D model that can be held in their hand,” said Dr. Rybicki. “Sometimes, the referring physician is a radiologist doing an image-guided procedure. There is a large amount of evidence showing that this is now an essential part of patient care.”

Radiologists will need to learn the software to convert images to DICOM, said Dr. Rybicki. “It is essential that radiologists invest the time to learn the methods so that the printing of medical models from CT and MR images becomes integrated with radiology departments,” he said. (See sidebar on related RSNA sessions.)

Continued on page 13A

Continued on page 18A

Radiation Safety
Tip of the Day

Even if it is your personal lead apron, if it is stored on-site at the clinic, it must be checked annually as part of a quality assurance program.

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Drayer Calls on Radiology Community to Support Research

RSNA Research & Education (R&E) Foundation Chair Burton P. Drayer, M.D., on Sunday called on the entire radiology community to band together in support of radiology research that will drive the specialty forward over the next 100 years.

By Cindy Lenert

I n the United States, we have the best biomedical science, the greatest store of intellectual talent and we’re spending more money than anyone else,” he said. “These are key resources, but right now they’re tied up in dysfunctional ways of operating.”

By Richard S. Dargan

S peaking at Sunday’s plenary session, Darrell G. Kirch, M.D., president and chief executive officer of the Association of American Medical Colleges (AAMC), in Washington, D.C., suggested the challenges facing the U.S. healthcare system also represent significant opportunities for physicians to take the lead in providing better care for individuals and populations at a reasonable cost.

“We must accept the move away from fee-for-service to population-based medicine, embrace the need for the alignment of hospitals and doctors and keep patients at the center of our focus,” said Dr. Kirch delivering the Special Lecture: Radiology, Medicine, and Healthcare: Will Eneation or Innovation Determine Our Future?

To underscore the importance of patient-centered approaches, Dr. Kirch asked to see, by a show of hands, how many physicians were in the large audience at the Arie Crown Theater. He then asked, “how many of you plan to be patients one day?”

The question generated much laughter, but the information Dr. Kirch shared about the current state of healthcare was far more sobering. A shortage of doctors is imperiling healthcare access, he said, even as the Affordable Care Act has enabled more Americans to get health insurance than ever before. Funding for the National Institutes of Health and for residency training positions is stagnant amid an atmosphere of partisan gridlock in Washington.

“In the United States, we have the best biomedical science, the greatest store of intellectual talent and we’re spending more money than anyone else,” he said. “These are key resources, but right now they’re tied up in dysfunctional ways of operating.”

By Cindy Lenert

Dr. Kirch said that radiologists and other healthcare providers and their institutions must take the lead in developing cutting-edge technology and migrate to payment models key on the value of rescuing people and more on keeping them well. He also advised the physician community to fight the high rate of job-related burnout by building resilience through team support and a shared sense of purpose.

“Don’t look at racial and income and educational inequalities as political issues but as ethical ones,” he said. “All of these inequalities are associated with health disparities, and as physicians we have an ethical obligation to do good for patients.”

In closing, Dr. Kirch shared an image of artist Luke Fildes’ painting, “The Doctor,” an iconic 1891 work that shows a physician paying a house call to a sick child while the concerned father looks on. He contrasted that image of a simpler time with today’s world of iPads, sophisticated scanners and large staffs.

“Can we retain that connection with the patient?” he asked, gesturing to the image. “That’s our task as we move forward.”

Innovative Leadership Vital in Transformative Era of Healthcare

Leadership styles that facilitate collaboration and team building are key factors to improving healthcare during this transformative era in medicine, according to one of the leading voices in medical education.

By Richard S. Dargan

We must accept the move away from fee-for-service to population-based medicine, embrace the need for the alignment of hospitals and doctors and keep patients at the center of our focus.”

Darrell G. Kirch, M.D.

Despite the alarming statistics, Dr. Kirch, a former medical school dean and healthcare system chief executive officer, expressed optimism for the future, so long as physicians take the lead in changing the culture of medicine. He noted that many physicians today remain embedded in a traditional culture of autonomy, competition and individualism—a culture that often conflicts directly with the healthcare desires of today’s patients.

“The traditional culture in healthcare and medical academia has been hierarchal,” Dr. Kirch said. “We need to transcend this culture of rugged individualism and figure out how to be much more collaborative.”

Selecting proper leaders is vital to the success of this process, he said. These new kinds of leaders will move away from committee-based models and harness the power of teams to bring out the maximum level of performance in the people around them.

“Historically we’ve selected leaders based on personal accomplishments as opposed to the ability to foster growth and form teams,” he said. “It’s wonderful if you’ve published dozens and dozens of research papers, but we need people with a talent for leadership too.”

Dr. Kirch said that radiologists and other healthcare providers and their institutions must take the lead in developing cutting-edge technology and migrate to payment models key on the value of rescuing people and more on keeping them well. He also advised the physician community to fight the high rate of job-related burnout by building resilience through team support and a shared sense of purpose.

“This enemy here is inertia and inaction,” he said.

Dr. Kirch said radiologists and other physicians can help address the inequalities of the day by remembering the ethical concerns that helped inspire them to seek a career in medicine.

“Don’t look at racial and income and educational inequalities as political issues but as ethical ones,” he said. “All of these inequalities are associated with health disparities, and as physicians we have an ethical obligation to do good for patients.”

In closing, Dr. Kirch shared an image of artist Luke Fildes’ painting, “The Doctor,” an iconic 1891 work that shows a physician paying a house call to a sick child while the concerned father looks on. He contrasted that image of a simpler time with today’s world of iPads, sophisticated scanners and large staffs.

“Can we retain that connection with the patient?” he asked, gesturing to the image. “That’s our task as we move forward.”

Technology Question of the Day

We just purchased a new CT scanner from a different vendor and it’s like trying to learn a new language to understand their parameters. How do I learn the new nomenclature? [Answer on page 13A.]
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Lorenzo Bonomo, M.D., has been a respected educator and leader among international radiologists during his decorated career in chest imaging. Dr. Bonomo’s scientific research fields include imaging of pulmonary circulation, lung cancer staging, and non-invasive cardiovascular imaging. His research is reflected in more than 350 scientific publications, which include four books and numerous book chapters.

Currently a professor of radiology and chairman of the Department of Radiological Sciences at the Catholic University of Rome, Gemelli Hospital, Dr. Bonomo is also director of the university’s training program in radiology.

Dr. Bonomo earned his medical degree at the Catholic University in Rome in 1970. After completing his residency training program in Rome he moved to Chieti University, Italy, where he spent more than 25 years and helped establish the radiology department. After starting as associate professor and interim chairman in the Department of Radiology, he became a full professor and department chairman from 1990 until taking his posts at Catholic University and Gemelli Hospital in 2003.

Dr. Bonomo has served as president of radiology organizations including the Italian Society of Thoracic Radiology from 1992 to 1996; the European Society of Thoracic Imaging (ESTI) from 1999 to 2000; and the First World Congress of Thoracic Imaging and Diagnosis in Chest Disease in 2005.

Dr. Bonomo received honorary membership from ESTI as well as from the Argentinean, French, German, Greek, Italian, Romanian, Serbian and Spanish radiological societies. He received a gold medal from the European Society of Emergency Radiology in 2013.

A pioneer and leader in international radiology, in 2001, Chamaree Chuapetcharasopon, M.D., successfully implemented the first totally digital radiology department in her native Thailand at Bumrungrad International Hospital, a 500-bed private hospital, which is still the leading center in the region.

Dr. Chuapetcharasopon received her medical degree with high honors from Ramathibodi Hospital, faculty of medicine, Mahidol University, in Bangkok, Thailand, in 1979. Dr. Chuapetcharasopon completed fellowships in vascular and interventional radiology and body imaging at MD Anderson Cancer Center, Houston, in 1990.

She also recognized for her medical informatics knowledge, Dr. Chuapetcharasopon has given numerous lectures domestically and internationally. She is currently a member of the Thai Medical Informatics Association and Executive Committee and has volunteered for 20 years with the Thai Medical Women’s Association.

After learning about the RSNA International Visiting Professor (IVP) Program in 2003, Dr. Chuapetcharasopon applied for the program on behalf of RCRT. In 2005, she hosted an IVP team whose members spent two weeks visiting teaching institutes and lecturing at the RCRT annual meeting. She was appointed to RSNA’s Committee on International Radiology Education in December 2013.

An internationally renowned expert and lecturer in thoracic radiology, Jung-Gi Im, M.D., Ph.D., has made a significant impact on the direction of radiology research in his native South Korea and beyond. Dr. Im is a professor of medicine at the Department of Radiology, College of Medicine, Seoul National University, where he served as executive vice-president from 2011 until 2014. He is also a consultant physician in radiology at Sheikh Khalifa Specialty Hospital in the United Arab Emirates.

Born in Korea, Dr. Im received his medical degree in 1975 and doctorate in medicine in 1983 at Seoul National University, where he served as dean of medicine from 2008 to 2011. Dr. Im completed his research fellowship in the Department of Radiology at the University of California, San Francisco, in 1987.

Dr. Im has served as principal investigator on numerous research projects focusing on imaging of pulmonary infections, lung cancer, diffuse interstitial lung disease, mediastinal and chest wall disease, and other issues. He has been an invited lecturer in nearly a dozen countries on three continents.

Dr. Im has published more than 200 articles and is the editor of two books on chest radiology. He also holds two patents in Korea. He has participated in the RSNA Annual Meeting as a session moderator and received multiple RSNA Certificates of Merit for Scientific Exhibition awards.

How Low Can You Go? New IR System Drops Dose by Nearly 96 Percent in Pediatric Patients

By Mary Henderson

With the help of new imaging protocols and a state-of-the-art interventional radiology (IR) system, researchers at Cincinnati Children’s Hospital have reduced radiation dose to pediatric patients undergoing 12 extremity thrombolysis procedures by as much as 96 percent, according to the presenter of a Sunday session.

Timothy Singewald, M.D., conducted a retrospective review of IR venous procedures performed on pediatric and young adult patients undergoing 12 thrombolysis procedures. Comparisons were then made between the groups, including total procedure dose, as measured by cumulative dose area product (DAP), DAP for the fluoroscopic portion of the procedure and DAP for the digital subtraction angiography (DSA) portion of each procedure.

Total procedure radiation doses were substantially reduced using the enhanced low-dose system compared to the reference system for both the IV filter filter placement/retrieval and thrombolysis procedures. For IV filter filter placement/retrieval, the median DAP was 3.5 Gy·cm² for the low-dose system versus 30.9 Gy·cm² for the reference system, yielding an 89 percent dose reduction with the new system. For thrombolysis, the median cumulative DAP was 25 Gy·cm² using the low-dose system versus 409 Gy·cm² for the reference system, resulting in a 94 percent dose reduction.

“With new low-dose systems, systematic dose reduction with no loss in diagnostic quality is possible for pediatric patients and young adults, which is good for patients and everyone in the IR room,” Dr. Singewald said.

Historically, DSA has accounted for a greater portion of the radiation dose during venous IR procedures. But with the new low-dose system, the dose during the DSA portion was reduced below that of the fluoroscopic portion of the exam, he said.

Images from Digital Subtraction Angiography (DSA) runs acquired during IV filter placement and thrombolysis in four different patients. Use of the enhanced low-dose interventional system (AlluraClarity, Philips Healthcare, Best, The Netherlands) resulted in dose reductions of 96 percent for IV filter placement and 93 percent for thrombolysis as compared to similar cases performed on a former interventional system as a reference (AlluraXper, Philips Healthcare, Best, The Netherlands).

Dose reductions were reported for both the fluoroscopic and DSA portions of both procedures on the new system, with the greatest reductions — 96 percent for each — achieved during the DSA portions of the procedures.
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Want to be a Successful Leader? Three of Radiology’s Most Prominent Leaders Tell You How

By Felicia Dechter

Successful leaders share a variety of traits including emotional intelligence, honesty, the ability to inspire confidence and an abundant optimism, according to a trio of radiology’s foremost leaders during the Sunday session, “How to Avoid Failure: Qualities of a Leader.”

The root characteristics of successful leaders, how these values build on each other, how to consistently demonstrate these core values and behaviors that can lead to failure were some of the topics discussed by Jonathan Lewin, M.D., senior vice-president for Integrated Healthcare Delivery at Johns Hopkins Medicine.

“Many of the most impactful opportunities are the informal leadership roles that we play in our organizations and these are available to everyone with dedication and a willingness to serve,” Dr. Lewin said.

Other critical traits include the ability to create and communicate a compelling vision, the ability to inspire confidence, unfailing respect for others and generosity of time and ideas, Dr. Lewin said.

“The misconception is that leadership requires commanding the troops, when in fact it requires serving the troops,” Dr. Lewin said.

James Brink, M.D., radiologist-in-chief at Massachusetts General Hospital and a professor of radiology at the Harvard Medical School in Boston, explained the pitfalls to avoid when dealing with confrontational issues and axioms to adopt to elevate respect in your organization.

Those include: Address others as you would like to be addressed; bring problems first to those responsible; look for the good in each other and relish it; do not put confrontational messages in writing; limit e-mail/text messages to the logistics of face-to-face meetings or phone calls (e-mail does not convey emotion, which can be confusing as many words have double meanings). And, “do not copy the world,” he added.

“Emotional intelligence with an emphasis on empathy, respect and selflessness are all necessary,” Dr. Brink said. Emotional intelligence, he said, is the ability to identify, monitor and discriminate among different human emotions and to use emotional information to guide thinking and behavior.

It’s time to change how our leaders are often selected, said presenter N. Reed Dunnick, M.D., professor and chairman of the Department of Radiology at the University of Michigan, in Ann Arbor.

“We do not prepare them for the next position and then express surprise when they fail,” said Dr. Dunnick, 2014 RSNA President. “That must change, and programs such as the RSNA Academy of Radiology Leadership Management (ARLM), are one way to participate in that change.”

Successful leaders put the organization ahead of themselves and possess a high degree of emotional intelligence. Equally important however, said Dr. Dunnick, is communication.

“We don’t do it well,” he said. “Sometimes it is unclear, sometimes too late, sometimes it’s not done at all.”

A good leader must have an appreciation of culture when leading any organization, Dr. Dunnick said. Find good people and support them, he said. Create a clear vision and communicate it in a compelling way.

Attendees were left with some basic principles to take with them.

“Walk the talk,” Dr. Dunnick said. “But be consistent and reward positive contributors.”

“Look for ways to help each other,” Dr. Brink said.

“Do not swing the imaginary sword in the corner until you’ve thought through the ramifications of your actions.”

Lastly, Dr. Brink added: “Trust is hard to come by and easy to lose. It can take a long time to overcome a negative reputation that develops because of a poorly thought out action.”

Precision Medicine Paves the Way for Patient-Specific Care

By Mike Bassett

In the not-too-distant future, imaging will no longer be applied generically for specific clinical indications, but instead will be tailored to meet the individual needs of the patient, according to the presenter of a Sunday session.

Presenter Ella Kazerooni, M.D., said radiologists will be able to leverage informatics to extract information from imaging alone or together with the huge amount of information available through the electronic health record (EHR) and other social data to deliver more patient-specific care.

“Think about Google Maps and think about the many layers of information that exist in Google Maps,” Dr. Kazerooni said during her presentation. “A vast amount of data goes out into what we see as a very superficial display and take for granted. But can we do that with healthcare? Can we integrate vast arrays of data to bring those to patient and provider? Instead of making a generic recommendation—that, for instance, a patient with a cancer needs to have an annual PET or CT scan—providers can use more personalized data to say this particular patient is a bit more at risk for a recurrence and should be imaged more frequently, she said. “Or the patient could have a lower risk and need imaging less frequently.”

This approach can also make a difference in the type of imaging needed, said Dr. Kazerooni, a professor of radiology, associate chair for clinical affairs, director of cardiothoracic radiology and service chief of diagnostic radiology at the University of Michigan.

In terms of thoracic CT scans, for example, protocols can be written in many different ways—depending on the individual questions being asked, she said.

“Something as simple as shortness of breath can be linked to any number of conditions, “but, by knowing more about the patient, we can do a more disease-specific protocol rather than using a generic one-size-fits-all approach,” Dr. Kazerooni said. “We can provide more precise—often quantitative—information to help follow a patient’s disease over time.”

While the idea of using “Big Data” to provide more precise medical care in imaging makes sense, the approach is still in the concept stage, she said.

“The proof isn’t out there yet—how it works in practice to lead to better outcomes is something that we need to see on a broader scale,” Dr. Kazerooni said.

Gradually, the approach is taking radiologists from the era of description and largely qualitative reporting into a quantitative mindset—an approach that could require changes in day-to-day practice, Dr. Kazerooni said. “It could mean that radiologists will have to change from being more descriptive in the way they report their exams to being more quantitative,” she said.

She pointed out that RSNA developed the Quantitative Imaging Biomarkers Alliance (QIBA), with the idea of transforming patient care by making radiology a more quantitative science.

“When you can start reporting metrics quantitatively, you have the data points you can extract from imaging that are much more precise,” she said.

Structured Reporting Key to Data Analysis

Structured reporting is critical to extracting and analyzing this kind of data. As an example, Dr. Kazerooni pointed to a software tool she and her colleagues use at the University of Michigan to view patients’ lung tissue.

Instead of reporting that a patient has mild emphysema that is centrilobular or paraseptal in its disease type, Dr. Kazerooni and her colleagues have quantitative metrics of chronic obstructive pulmonary disease (COPD) they can put into their structured report, which can include total lung volume, the percentage that is normal lung tissue, the percentage that is emphysema, and—most importantly—the percentage of the tissue that is functional small airway disease or what is essentially pre-emphysema.

“I can take individuals with the same clinical stage of disease and I can show that they have very different lung imaging signatures,” she said. “And that while one already has emphysema, the other patient has no emphysema. And if we can find all those population risks [for that patient without emphysema] that exist in the EHR, and all the social data and exposures—identify them and potentially treat them—we can prevent what we know as emphysema or late-stage tissue destruction.”

“We’re extracting information that has been in CT scans for years, but we haven’t been able to measure, describe and report it in a very precise manner,” Dr. Kazerooni said. “These are the kinds of software tools that are being developed and commercialized that radiologists will be able to use—and the one for COPD is just one of many in development.”
More to See at RSNA 2015: Sessions in Every Subspecialty

Here’s just a sampling of what RSNA attendees can access in educational courses, scientific sessions and posters and exhibits in every subspecialty. View scientific posters and education exhibits in the Learning Center through Friday. Virtual meeting registrants may also view posters and exhibits by logging on from in or outside McCormick Place.

CARDIAC/NUCLEAR MEDICINE
RC011 (Educational Course)
Advances in Cardiac Nuclear Imaging: SPECT/CT and PET/CT
Thursday, Dec. 3, 8:30-10:00 a.m.
Room S504CD

Advancements in camera and software technology have improved SPECT image resolution and increased counting statistics. But even with such advancements, attention to technical detail is essential to assure optimal image quality. In the session, “Advances in Cardiac SPECT,” presenters will discuss the instrumentation advances that allow new cameras to perform SPECT with markedly reduced acquisition times and/or less radio-pharmaceutical activity. In “Advances in Cardiac PET,” presenters will review the advantages and disadvantages of myocardial perfusion PET compared to SPECT for evaluation of coronary artery disease.

GENITOURINARY RADIOLoGY
GJ08-ED-X (Education Exhibit)
Acute Severe Alcoholic Steatohepatitis (ASH) as the First Presentation of Alcoholic Liver Disease (ALD): Multi-modality Imaging Findings
All Day-Genitourinary (GD) Community Learning Center

This educational exhibit showcases the radiological findings of acute severe Alcoholic Steatohepatitis (ASH) and uses these findings to diagnose acute severe ASH in the correct clinical context; highlights the possibility of acute severe ASH occurring in the absence of cirrhosis; demonstrates how imaging findings can distinguish acute severe ASH from other causes of acute hepatitis and from decompensated alcoholic cirrhosis; and outlines the outcomes and treatment options available in acute severe ASH.

HEALTH POLICY
RC324 (Educational Course)
Dialogue with the Joint Commission: New Diagnostic Imaging Standards for CT and MR
Wednesday, Dec. 2, 8:30-10:00 a.m.
Room S604AB

Presenters will give an overview of the new and revised diagnostic imaging standards and offer a description of how compliance with these standards will be evaluated during Joint Commission on-site surveys. The session will also cover methods for demonstrating compliance with the new and revised imaging standards to promote patient safety and care.

INFORMATICS
SSG08-05 (Educational Course)
Pilot Study of a Global Radiology Report Categorization (RADCAT) System in the Emergency Department
Tuesday, 11:10-11:20 a.m.
Room S402AB

Researchers developed a global categorization system for radiology reports in the emergency department and evaluated the inter-observer variation of the system as a first step in establishing its clinical utility. They report results of their pilot RADCAT system in globally characterizing radiology reports and providing valuable shorthand for communication between radiologists and emergency medicine physicians through the electronic medical record.

INTERVENTIONAL RADIOLOGY
SPSC40 (Educational Course)
Controversy Session: “My Back Hurts”
Fluoroscopy or CT-guided Intervention?
Wednesday, Dec. 2, 7:15-8:15 a.m.
Room E451B

Presenters will identify various etiologies of low back pain and neck pain that may be amenable to image-guided pain injections, develop a pain management plan utilizing image-guided injections and assess what imaging findings and clinical symptoms are appropriate for the injections. In two sessions, “For Fluoroscopy Procedures,” and “CT Injection Procedures,” presenters will discuss the advantages and disadvantages of CT versus fluoroscopically guided pain injections.

LEADERSHIP MANAGEMENT
MSRT32 (Educational Course)
ASRT@RSNA 2015: Patient-centered Imaging and the Role for the RA in a Changing Healthcare Environment
Thursday, Dec. 3, 9:15-10:15 a.m.
Room N230

Providing patient-centered care has become increasingly important in today’s healthcare environment. But while radiology consultation has traditionally been a part of standard clinical practice, the current fee-for-service payment model and technologies such as PACS have limited the availability of the radiologist. In this American Society of Radiologic Technologists (ASRT)/RSNA session, presenters discuss the role of the Radiologist Assistant in alleviating the radiologist’s workflow constraints for non-interpretive tasks. The session will focus on radiology consultation and promoting patient-centered imaging, ultimately increasing the quality of patient care.

MUSCULOSKELETAL
RC08-04 (Educational Course)
Distal Clavicular Osteolysis in Adults: Prevalence, Predisposing Factors, Treatment and Outcome
Friday, Dec. 4, 9:15-9:25 a.m.
Room E451A

Presenters share findings of a study investigating the prevalence, imaging findings, treatment and outcome of distal clavicular osteolysis (DCO) in adults as well as the association with bench pressing intensity. Researchers examined patients with traumatic DCO in a retrospective review of 4,217 consecutive MRI shoulder reports of men and women between 20 and 40 years old.

NEURORADIOLOGY
SPSC-42 (Educational Course)
Controversy Session: Concussion and Dementia: Will Football be the Tobacco of this Century?
Wednesday, Dec. 2, 4:30-6:00 p.m.
Room E331

Presenters will discuss the functional and pathophysiologic consequences of concussion in two sessions: CTE (Chronic Traumatic Encephalopathy) and Dementia: Causation? The session covers the prevalence of chronic traumatic encephalopathy, its demographics and distinguishes those features from the more widely prevalent aspects of Alzheimer’s dementia-related disorders.

PHYSICS
SSJ22-04 (Scientific Session)
Dose or Noise Reduction for Dynamic CT Perfusion: 4D Adaptive Time-Intensity Profile Similarity (atIPs) Bilateral Filters (BF)
Tuesday, Dec. 1, 3:30-4:30 p.m.
Room S403B

Researchers will discuss the possibility of reducing image noise (or, alternatively, patient dose) when employing a time-intensity profile similarity (atIPs) bilateral (BF) filter, making quantitative dynamic CT perfusion more robust, potentially leading to a higher clinical acceptance in daily routine.

QUALITY
QS127-ED-WEB2 (Quality Storyboard)
1-800-Imaging Pilot Project: Building Partnerships Between Primary Care and Medical Imaging
Wednesday, Dec. 2, 12:45-1:15 p.m., Quality Storyboards (QS) Community, Learning Center

Researchers report the results of a pilot project to create a 1-800 Imaging Call Centre in Ontario, Canada, to improve integration between primary care providers in the community (PCPs) and medical imaging within a tertiary sub-specialized environment. This virtual hub gives PCPs a direct point of contact within a complex, academic medical imaging department to facilitate real-time consultation with a sub-specialized radiologist and to escalate urgent imaging requests.

Subspecialty content brochures will be available in the Grand Concourse Lobby, Level 3; Lakeside Center, Level 3 and Learning Center.
RSNA 2015 Sessions Harness the Power and Potential of Technology

From the rise of personalized medicine and genomics to the explosion of data and information technology (IT), technological changes are occurring at a dizzying pace, said 2015 RSNA President Ronald L. Arenson, M.D., in the President’s Address Sunday at the Arie Crown Theater.

“Because radiology will be more in demand than ever in the next century, it’s critical for the specialty to align with and respond to the changes occurring at warp speed,” Dr. Arenson said.

“Achieving success means embracing innovation in new ways—and working as a profession to ensure that technology change is managed effectively,” Dr. Arenson said.

Attendees can start at RSNA 2015. The RSNA 2015 Meeting Program offers a staggering number of sessions that demonstrate the power and potential of technology that represent the future of radiology—and of healthcare. Below is a sampling.

Ronald L. Arenson, M.D.
In her Sunday afternoon poster discussion, Dr. Kelil described how physicians at Brigham and Women’s Hospital are preparing to use 3-D CT and printing to improve accuracy in preoperative planning and operative flap harvest. “Breast reconstruction is an integral part of breast cancer management and has been shown to positively impact the patient’s psychosocial adjustment and quality of life,” said Dr. Kelil, a radiology resident specializing in breast imaging. “Yet many women undergo repeated secondary procedures to correct asymmetry.”

Reconstruction of the breast following mastectomy involves either implants or autologous tissue flaps, in which a flap of skin, tissue, fat and sometimes muscle is excised from the abdomen and reattached to the chest. The procedure presents challenges for breast surgeons, including obtaining volume measurements of the diseased breast and the replacement flap or implant.

“Any technological innovation such as 3-D printing that promises to enhance surgical outcomes and improve a woman’s quality of life should be embraced and further investigated.” Tatiana Kelil, M.D.

Dr. Kelil said 2-D photography and physical examination are currently used to estimate tissue volume. “But the methods used to determine the volume, shape and contour of the breast and size of the flap that needs to be harvested are subjective,” she said.

Once harvested, the flap is serially excised until it matches the weight of the removed breast and symmetry of the contralateral breast. “Matching the breast volume with the volume of the flap or implant is currently performed during surgery,” she said. “This prolonged intraoperative tissue plane alteration can induce fat necrosis and poor surgical outcomes.”

Dr. Kelil said harvesting a flap that is more than the required volume can also lead to tissue waste; she cited a study that reported average breast reconstruction volume of 568 cm³ and an average flap volume of 725 cm³. “Finding the location and course of dominant vessels with 2-D imaging is also a challenge for surgeons during breast reconstruction.”

Identifying the dominant perforator vessels is difficult with 2-D CT and requires a lot of back and forth between the image screen and surgery table,” she said.

3-D Printed Models Help Reshape Tissue

Dr. Kelil said volumetric CT imaging is useful for determining the volume of flap that needs to be harvested and for identifying the location and course of dominant vessels, which can reduce tissue waste, sedation times and the potential for vessel injury. To optimize symmetry, 3-D printed models of the contralateral breast can also be used intraoperatively to help reshape the soft tissue flap.

“One may assume that breast reconstruction surgeries are just cosmetic, but the fact that some women refuse mastectomy and would rather die than live without a breast signifies how a woman’s breasts are intricately associated with her self-image and feminine identity,” she said.

Dr. Kelil once considered the detection of breast cancer before it metastasized followed by a mastectomy a triumph for both medicine and the patient, but her views changed after reading a book that chronicled one woman’s journey following a mastectomy. “Although lifesaving, mastectomy can cause tremendous distortion of body image, leaving survivors feeling less feminine, desirable and incomplete,” she said. “Any technological innovation such as 3-D printing that promises to enhance surgical outcomes and improve a woman’s quality of life should be embraced and further investigated.”

Dr. Kelil said additional applications for the technology include printing customized prostheses and shields for radiation therapy as well as breast phantoms that more closely resemble life-like tissue for education and training.
**2015 Outstanding Researcher and Educator**

*During the RSNA 2015 Opening Session on Sunday, President Ronald L. Arenson, M.D., honored G. Scott Gazelle, M.D., M.P.H., Ph.D., professor of radiology at Harvard Medical School, Boston, as the 2015 RSNA Outstanding Researcher. Key N. Vydra, M.D., professor emeritus in Emory University’s Department of Radiology, Atlanta, was honored as the 2015 RSNA Outstanding Educator.*

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Evaluations become available 10 minutes after courses begin. You can also claim your CME credits onsite and even print a certificate. Credits are automatically added to the RSNA CME Repository for RSNA members. For assistance, stop by the Mobile Connect Booth in RSNA Services.

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**Special Lecture Dedication**

SUNDAY’S SPECIAL lecture is dedicated to the memory of Joseph N. Gitlin. Dr. Gitlin was a visionary proponent of medical informatics and a founding member of the Radiology Information System Consortium, which helped launch a revolution in imaging informatics.

Throughout his career, Dr. Gitlin worked adeptly with government, radiologists and vendors to continually push the specialty forward.

His interest in medicine was sparked as a young man growing up in a coal mining town. He was acutely aware of the health risks of the local occupation, and he often peppered the family physician with questions about the practice of medicine.

As an undergraduate at the University of Pennsylvania he was accepted into the Naval Reserve Officer Training program, where he specialized in medical training. With just one year of training, Dr. Gitlin was called to active duty and found himself the ship’s doctor on a Navy destroyer escort.

After earning a Master's of Public Health degree from John Hopkins University, Dr. Gitlin turned his attention to studying the benefits of applying computer technology to radiology department operations. Later in his career, Dr. Gitlin joined John Hopkins University as an associate radiology professor and continued to explore medical informatics.

Dr. Gitlin died August 2, 2014, at 86 years old.

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The AAPM has CT Lexicon protocol that is available online that provides translations of different terms for different manufacturers. 

Q&A courtesy of AAPM.

Daily bulletin • Monday, November 30, 2015

Ronald L. Arenson, M.D.

New Image Wisely Radiation Safety Case Available

The eighth Image Wisely® Radiation Safety Case—C-arm Based Cone Beam CT in Interventional Radiology—is now available to help radiologists, imaging technologists and medical physicists assess their understanding of important radiation safety concepts, including dose monitoring and optimization.

Developed by RSNA, ACR, AAPM and ASRT, this case explains the basic concepts of C-arm based cone-beam computed tomography (CBCT) and the differences in determining radiation dose between cone-beam CT and multidetector CT. “C-arm based CBCT—with its ability to depict vessels in multiple planes and also to show soft tissue contrast—has the potential to substantially improve the outcomes of interventional radiology procedures,” said Sharjeel Sabir, M.D., University of Texas MD Anderson Cancer Center in Houston, who co-authored the case with Kyle Jones, Ph.D., also of UT MD Anderson Cancer Center.

“Care should be taken when performing CBCT scans to limit the number during a procedure to only those necessary for meaningful imaging and patient safety,” said Donald J. Peck, Ph.D., FACR., director of the Image Wisely Radiation Safety Case series and member of the Image Wisely executive committee.

Continuing education credit for radiologists, imaging technologists and medical physicists is available. This case is directed primarily toward physicians, residents and interventional technologists.

Image Wisely is an initiative of RSNA, ACR, AAPM and ASRT.

RSNA 2015 attendees can pledge to Image Wisely at the RadiologyInfo booth in the RSNA Services area in Lakeside Center, or at the ACR, AAPM or ASRT booths in the exhibit halls.

Camera that can capture 100 billion frames per second, and new devices such as smartphone-sized imaging devices and radio frequency identification bracelets designed to eliminate the possibility of patient identification errors.

“In the face of all this, radiology must be willing to change and explore new frontiers—to find new ways of delivering care and adapting to circumstances,” Dr. Arenson said.

When it comes to technology, radiology is unique from many other medical specialties in pioneering and adapting to the latest IT advancements. The development of the first modern radiology information system grew from the birth of the Radiology Information System Consortium (RISC) in 1980.

Through the initiative Integrating the Healthcare Enterprise (IHE), radiology did pioneering work in helping maximize the impact of the DICOM standard. During that time, millions of patients benefited from radiology’s work in dose reduction.

The progress continues today with RSNA’s development of RadLex, which uses a unified language of radiology to streamline information-sharing.

To turn its potential into reality, Dr. Arenson said radiology must demonstrate the value of the profession as catalyst, create a culture of support for research, cultivate cross-sector partnerships, and spur integration of technology infrastructure.

“Let’s not forget that each of us as individuals also has the power to help advance our profession’s embrace of technology,” Dr. Arenson said.

He suggested individuals can do that by becoming technology adopters in their own practices and being patient-centric. By participating in RSNA’s Radiology Cares, Image Share, IHE and the Quantitative Imaging Biomarkers Alliance, radiologists can help to advance the profession.

“By taking these steps, we will ensure that as radiology takes its own journey—‘to boldly go where no one has gone before’—we do so with sensible policies and a strong vision that benefits the patients we serve,” Dr. Arenson said.

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Virtual Autopsy Connects Radiology and Forensics

By Paul LaTour

VIRTUAL AUTOPSIES offer several advantages over the traditional approach and help connect radiology with forensic medicine. Unlike the traditional model, a virtual autopsy is an invasive approach that doesn’t harm the body or tamper with forensic evidence, according to Michael J. Thali, M.D., who presented on Sunday.

The method creates permanent 3-D models that can be easily accessed and the data quickly relayed via computer to aid in getting a second opinion, he said.

Dr. Thali, professor and chair of the Institute of Forensic Medicine at the University of Zurich in Switzerland, co-founded The Virtopsy Project in 1999. Since then virtual autopsies have become standard procedure for forensic investigations in Switzerland, and an emerging procedure around the globe.

Although the technique has been featured on episodes of “CSI: NY” and “CSI: Miami,” virtual autopsies have yet to reach wide recognition within United States.

Dr. Thali acknowledged that cost may be a factor, but added that the benefits outweigh the costs.

“It is a little bit expensive, but because you have this 3-D information you can always go back to it,” Dr. Thali said, explaining that traditional autopsies by nature change the integrity of the anatomy. He added that he expects the costs to decrease as technology improves and the practice gains popularity.

The information produced by the individual modalities is then merged into a robotic system called Virtobot, which creates a 3-D, high-resolution computer images to document an injury. In the case of a bite mark, for example, Dr. Thali said a 3-D morphological fingerprint of the mark on the body is created. That image can be compared to the dental records of the suspect, if available, to see if it matches.

Visualization is a key component in the value of virtual autopsies. As an example, Dr. Thali pointed to a domestic violence case in which the victim had been kicked by her husband, causing a torn pancreas. The 3-D recreation of the injury provided a better understanding for court officials during the trial.

“Our customer (the court system) often has no real knowledge of the body’s internal structures, so having 3-D visualization is a good tool to show what really happened to the body,” Dr. Thali said.

Another advantage of virtual autopsy over the conventional method is that it speeds the decision-making process because imaging can be done quickly. Also, the process is observer-independent, allowing for objective data archiving, he said. Finally, virtual autopsies can be used in cultures and situations where conventional autopsy is not tolerated for religious reasons or is rejected by family members.

In the United States, virtual autopsies still are not used as standard procedure, though they are being utilized by the U.S. military. Since 2006, the bodies of soldiers arriving at Dover Air Force Base in Dover, Del., undergo whole-body multi-slice CT as part of the postmortem examinations.

Virtopsy is also used at forensics institutes in Baltimore and Albuquerque, New Mexico, to gather forensic information that simplifies the process of death investigations.

Dr. Thali said he wants to see collaboration of the radiology and forensics fields, especially as technology improves and makes virtual autopsies even more beneficial.

“With virtual autopsy, imaging becomes the gold standard in the future examination of forensic evidence,” Dr. Thali said. “At the moment, we cannot see everything with imaging, but judging by the (technology) on display at RSNA 2015, I think the direction is absolutely clear.

Experts Debate Controversies Surrounding Hodgkin’s Lymphoma

When should radiation therapy be used to treat patients with Hodgkin’s lymphoma?

By Mike Bassett

THAT QUESTION is becoming somewhat controversial according to Karen Winkfield, M.D., Ph.D., director, Hematologic Radiation Oncology, Massachusetts General Hospital, during the Sunday session, “Oncodiagnosis Panel: Hodgkin’s Lymphoma: Current Controversies.”

One problem facing radiation oncologists is that their medical oncology colleagues are often hesitant to send patients for a radiation therapy consultation because of concerns about associated toxicities.

“Back in the day there were many side effects accompanying radiation therapy,” Dr. Winkfield said. “But remember, Hodgkin’s lymphoma is often curable. We have cure rates for patients in stages 1 and 2 that are well above 90 percent, so we always have to be thoughtful about the actual volume of tissue that we are irradiating. With modern radiotherapy, radiation oncologists have dramatically changed the way we both deliver and the tools we use in order to determine how we deliver radiation therapy.”

For example, 3-D conformal radiation therapy provides better shaping of the beam, improved visualization of the tumor and surrounding normal tissue and better dosimetry, she said.

These newer technologies and techniques help reduce the amount of radiation patients are exposed to, and by extension, the acute and late toxicities they experience.

“For much of that we depend heavily on our radiology colleagues in terms of not only what they are imaging, but how they report that imaging and where they see sites of the disease,” she said. “And unlike when we just treated all the node areas, now we are honing in on involved node and involved site radiation therapy.”

Assessment Criteria Revised

In another presentation, Steve Y. Cho, M.D., of the University of Wisconsin-Madison, discussed the latest developments surrounding the role of imaging for response assessment in Hodgkin’s lymphoma, including recent revisions to response assessment criteria.

These revisions—the Lugano Classification, published in 2014—were guidelines issued in 2007. According to Dr. Cho, one of the differences between the two is that the Lugano Classification involves CT-based response criteria.

The 2007 criteria examined whether or not a patient was a complete responder based on metabolic PET information, regardless of how much the tumor shrank. The Lugano Classification reaffirms that a patient is in complete remission—even with a residual mass—as long as the mass is not FDG-avid.

However, “it actually reintroduced some CT-based response criteria,” Dr. Cho said. Now, a partial response to treatment requires a decrease by more than 50 percent in the sum of the product perpendicular diameters of up to six targeted lesions, while a progressive disease assessment requires only an increase of a single lesion by 50 percent.

From left: Steve Y. Cho, M.D., Satish Shanbhag, M.B.B.S., M.P.H., Karen Winkfield, M.D., Ph.D.

Oncologists and Radiologists Forming Closer Partnerships

In a third presentation, Satish Shanbhag, M.B.B.S., M.P.H., pointed out that evolving changes in therapeutic strategies are forging closer partnerships between oncologists and radiologists.

For example, immunotherapy for Hodgkin’s lymphoma is one area that “we really need more collaboration between oncologists and radiologists,” he said.

In one issue involved with immunotherapy—pseudoprogression—treatment sees a delayed clinical response in which an apparent improvement is followed by a tumor rebound in later followed by tumor regression.

“So it’s important for us to assess responses not just with a knee-jerk reaction to the first scan,” Dr. Shanbhag said. “We have to wait for the second scan. It’s really important that oncologists and radiologists talk to each other before we read scans in patients with immunotherapeutics.”
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Next Generation PET/CT Technology Paves Way to Better Patient Care

The next generation of PET/CT scanners using solid-state technology and all-digital data are a substantial improvement in image quality over current technology, said study author Michael Knopp, M.D., during a Sunday session.

**Increased Precision, Lower Dose**

The latest scanners have a number of advancements over multiplier tubes, Dr. Knopp said. First, the scanner has a direct 1-to-1 ratio with the crystal, which is a 50-fold increase over photomultiplier technology. Second, the temporal resolution of the new scanner has improved from 500 picoseconds down to 325 picoseconds. Finally, the imaging is digital from beginning to end, dramatically improving image reconstruction.

“We can get very high resolution reconstruction without any compromise in quality,” Dr. Knopp said, adding that slice thickness can go as thin as 1-2 mm vs. the current 3-4 mm slice thickness.

The study also suggested that the new scanners can produce high-quality images using half the dose of current technology. Tracer dose simulations indicate that no impact on quality and detectability was found while reducing the count equivalent from 13 millicurie (mCi) fluorodeoxy-glucose (FDG) to 6 mCi, Dr. Knopp said.

The increased precision of the new technology will lead to clinical improvements in detecting metabolic activity. “We are surprised that we can now see smaller metabolic activity at a level of clarity and precision that we have not seen before, without a loss of specificity,” Dr. Knopp said.

Radiologists testing the new technology as part of the study could detect lesions smaller than 1 cm with clarity, which was impressive, Dr. Knopp said. For the study’s purposes, however, the researchers selected 1.5 cm as a standard.

Dr. Knopp said the new scanners could have non-oncological uses such as in sports medicine and neuroscience. “This technology can redefine our clinical work, especially with some of the exciting new tracer doses on the horizon,” Knopp said.

**This is not your father’s PET.**

Martin Pomper, M.D.
Cryoablation Shows Potential as Safe, Cost-Effective Treatment for Kidney Cancer

By Ed Bannon

CT-guided percutaneous renal cryoablation should receive more consideration as an option for treating cancerous kidney tumors because it is a safe and lower-cost treatment option, according to a researcher who followed up with patients for as long as seven years.

During his Sunday session, Hussein D. Aoun, M.D., presented the results of research showing that the cryoablation procedure resulted in few complications and had almost no recurrence rates.

“It is time for a paradigm shift to include percutaneous cryoablation as a standard of care,” said Dr. Aoun, an interventional radiologist with the Karmanos Cancer Center in Michigan. Dr. Aoun strongly advocates for the procedure because he says multiple studies have shown it is less invasive, less costly and less painful than other techniques.

Follow-up on 372 tumors removed under 348 procedures, the study concluded that the technique was safe and effective for all but a few of the 294 patients treated.

“Plus, with CT, you have excellent visualization,” Dr. Aoun said, noting that laparoscopic and surgical removal do not allow a physician to visualize a tumor before the procedure. “You can really see the ice ball engulf the tumor.”

Several studies have shown that percutaneous cryoablation can be effective, and his study shows there is no evidence of long-term complications. His research followed many patients for several years to evaluate any health effects from the procedure. The mean follow-up was 2.3 years with 106 tumors having a longer than three-year follow-up, 54 tumors having longer than five-year follow-up and 20 tumors having longer than seven-year follow-up.

The study’s long-term follow-up has been important because life expectancy should be factored into treatment options, Dr. Aoun said. Because percutaneous cryoablation is less traumatizing than open surgery, it might be a better option for an older person.

All the procedures were performed under conscious sedation and were virtually painless during and after the procedure. “Most go home the same day,” Dr. Aoun said.

The study demonstrated a 99.7 percent efficacy rate of renal cancer under the long-term follow up. The initial local recurrence rate was 2.4 percent with 9 tumors out of 372 recurring. Some of those recurrences were attributed to equipment failures and others were tract recurrences. Of the local recurrences, all but one was able to be re-ablated, which resulted in the 99 percent efficacy conclusion.

The procedure was determined to be safe as only 10, or 2.9 percent, of the procedures resulted in major complications, which were classified as grade 3. Three of the major complications were related to hemorrhage requiring transfusion.

The average tumor and ablation size was 3.1 cm and 5.0 cm, respectively, with the largest tumor measuring 10.3 cm. Although some have suggested that patient weight is a factor in the efficacy of percutaneous renal cryoablation, Dr. Aoun’s study did not find a correlation.

Although the study focused on renal cryoablation, Dr. Aoun performs cryoablation on many organs and soft tissue. “The rising cost of healthcare mandates consideration of renal cryoablation as a cost effective treatment option,” Dr. Aoun said.

Obstetrical Ultrasound Technique Improves Care in Resource-poor Areas

An easy-to-learn volumetric imaging technique has the potential to widen the reach of obstetric ultrasound and reduce infant mortality in resource-poor regions of the world, according to research presented Sunday.

By Richard S. Durgan

Women in medically underserved communities throughout the world often have no access to basic obstetrical imaging during their pregnancies due to a lack of resources and trained personnel. Without ultrasound, potentially dangerous complications of pregnancy can go undetected, resulting in increased maternal, infant and neonatal mortality.

Study author Kristen K. DeStigter, M.D., from the University of Vermont College of Medicine, said firsthand the value of ultrasound in resource-poor communities while working in Africa in the 1990s. In 2007, she partnered with Brian Garra, M.D., an expert in ultrasound volume scans, which replace each still ultrasound image with a series of images gathered by sweeping the transducer across the organ or body area of interest. Through their foundation, Imaging the World, Drs. DeStigter and Garra developed a protocol for capturing these volume scans—also known as “cine loops” or ultrasound sweeps—and sending them across the Internet to an obstetrical expert for evaluation. The technology is highly portable, relatively inexpensive, and previous research has shown that the scanning portion can be taught in a just few hours to people with no experience.

“When we first started, it was just an idea,” Dr. DeStigter said. “It is time for a paradigm shift to include percutaneous cryoablation as a standard of care,” said Dr. Aoun, an interventional radiologist with the Karmanos Cancer Center in Michigan. Dr. Aoun strongly advocates for the procedure because he says multiple studies have shown it is less invasive, less costly and less painful than other techniques.

“Plus, with CT, you have excellent visualization,” Dr. Aoun said, noting that laparoscopic and surgical removal do not allow a physician to visualize a tumor before the procedure. “You can really see the ice ball engulf the tumor.”

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It is time for a paradigm shift to include percutaneous cryoablation as a standard of care.” Hussein Aoun, M.D.
Converting DICOM Images to 3-D Printed Models Critical to Progress

CONTINUED FROM COVER

Dr. Rybicki first began moderating didactic courses in 3-D printing at RSNA 2013. For the first time last year, participants were taught the software used to convert the image from a CT scan to a handheld printed model. At this year’s session, they did the same.

Reimbursement, Cost Remain Hurdles

There are a number of obstacles to more mainstream adoption of 3-D printing, including cost, training, materials, equipment, guidelines and the need for a consensus in terminology.

“If we’re going to get reimbursement, we need a single reporting standard for 3-D printing,” Dr. Rybicki said.

And reimbursement, he said, will be a major hurdle.

“All payors know that we need 3-D printing, and that it will eventually be reimbursed as the demand continues to swell,” he said. “It will happen, but there are a lot of pressures to contain costs.”

“Many vendors at RSNA 2015 are introducing new 3-D printing software, hardware and new collaborations,” he said “This will drive down the costs over time.”

**RSNA 2015 Sessions**

**3-D Printing in Radiology (IN121-ED-TUA6)**

Tuesday, Dec. 1, 12:15-12:45 p.m., Informatics (IN) Community, Learning Center

Presenters review 3-D printing technologies important to radiology practice; describe the steps to create a Standard Tessellation Language (STL) file from DICOM images; and illustrate the uses of 3-D printing in radiology.

**3-D Printing (Hands-on) (RCA33)**

Tuesday, Dec. 1, 12:30-2:00 p.m., Room S401AB

The session will begin with a DICOM file and proceed through the steps to create a printable Standard Tessellation Language (STL) file. Attendees will learn to convert a set of DICOM files into a 3-D printed model through a series of simple steps.

**3-D Printing (Hands-on) (RCA51)**

Thursday, Dec. 1, 8:30-10:00 a.m., Room S401AB

This session repeats the Tuesday session.

Enjoy 5k Fun Run on Lake Michigan

Attendees are encouraged to take a break from the annual meeting on Tuesday morning to get out and enjoy a 5k event along Chicago’s beautiful Lake Michigan shores. Proceeds from the 5k Fun Run go to the RSNA R&E Foundation to help fuel critical research to enable the best patient care. Add the Fun Run to your online registration or stop by the Fun Run desk (level 2.5 at McCormick Place) from 7:30 a.m. to 5:30 p.m. Monday. Participants can sign up as a runner or walker. The sign-up donation of $40 is fully tax deductible and includes a commemorative T-shirt. The run will be held at 6:30 a.m., Tuesday, December 1, at Arvey Field, South Grant Park, Chicago.

**New Horizons Lecture Presented Today**

Immelt will deliver the New Horizons Lecture “Redefining Innovation” in Monday’s plenary session. Immelt held several global leadership positions since joining GE in 1982, including roles in plastics, appliances and healthcare businesses. Immelt became a GE officer in 1989 and joined the GE Capital Board in 1997. He has served as GE’s Chairman and CEO since 2001.

Immelt has been named one of the World’s Best CEOs three times by Barron’s. Since Immelt began serving as CEO, GE has been named “America’s Most Admired Company” in a poll conducted by Fortune magazine and one of the World’s Most Respected Companies in polls by Barron’s and the Financial Times.

In other roles, Immelt served as chair of President Obama’s Council on Jobs and Competitiveness and as a member of the American Academy of Arts & Sciences.
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