



Daily Bulletin

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Hedvig Hricak, MD, PhD, Dr (hc) delivers the New Horizons Lecture.

Radiology Should Embrace— Not Fear—the Future

Radiologists have an opportunity to turn fear of the future into a leadership role as cancer care enters the value-driven era, according to Hedvig Hricak, MD, PhD, Dr (hc), during her New Horizons Lecture, “Beyond Imaging: Radiology of Tomorrow.”

By Richard Dargan

A renowned leader in oncologic imaging, Dr. Hricak asserted that fear of new technologies like machine learning (ML) are misguided. She noted that many predictions based on fear end up being wrong, such as when David Ricardo, an economist of Industrial Age England famously predicted that mechanization would have dire consequences for humanity.

“In contrast, the overall effect of mechanization turned out to be job creation on an unprecedented scale, and I think that’s

going to happen to our specialty,” said Dr. Hricak, chair of the Department of Radiology at Memorial Sloan-Kettering Cancer Center, professor of radiology at Weill Cornell College of Medicine and professor at Gerstner Sloan-Kettering Graduate School of Biomedical Sciences, all in New York City.

For evidence, Dr. Hricak pointed out numerous examples of how radiology has provided new insight into cancer. Imaging showed that individual breast cancer lesions could have areas that test positive for human epidermal growth factor recep-

tor 2 (HER2) and areas that test negative. Imaging also showed that a primary breast cancer can be HER2-negative, while the metastases are HER2-positive.

Imaging was pivotal in a new understanding of Phase I cancer drug trials that traditionally involved dose escalation to the maximum tolerance of patients. Some patients actually did worse with an escalated dose, suggesting that biology was more important than dose.

“Estrogen receptor imaging showed differences between biology-driven and maximum tolerable dose,” Dr. Hricak said. “This is probably one of the greatest

examples of patient-centered, value-driven healthcare.”

Radiology will face significant challenges as precision medicine develops and matures, Dr. Hricak said. Among the key needs are a better understanding of tumor biology, improvements in clinical trial designs and integrated diagnostics for understanding tumor ecology. In therapy, the future offers unprecedented potential for expansion and new programs, provided that interventional radiologists get support in the form of research infrastructure, dedicated IR rooms and admitting privileges.

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Langlotz Named to RSNA Board

CURTIS P. LANGLOTZ, MD, PHD, a renowned imaging informatics leader and committed advocate for improved radiology reports, joins the RSNA Board of Directors as the liaison for information technology and annual meeting, as Valerie P. Jackson, MD, becomes chairman of the Board of Directors. Matthew A. Mauro, MD, will assume the role of liaison for education.

“RSNA is the most effective research and education organization representing our specialty, so it is a special privilege to take on this new role,” Dr. Langlotz said. “As information technology increasingly influences the future of radiology, I look forward to serving RSNA and its members as they harness innovative technologies to optimize science, education and patient care.”

Dr. Langlotz is professor of Radiology and Biomedical Informatics and associate chair for Information Systems in the

Department of Radiology at Stanford University. As medical informatics director for Stanford Health Care, he is responsible for the computer technology that supports the Stanford Radiology practice.

A long-time member of the RSNA Radiology Informatics Committee and an informatics advisor to RSNA, Dr. Langlotz has contributed on a global scale to the growth of informatics in radiology. For more than 15 years, he has led the development of numerous RSNA informatics initiatives, including the RadLex® terminology standard, the LOINC-RadLex Playbook of standard exam codes and the RSNA report template library. He has also served as a member of the RSNA Publications Council, the Research Development Committee and the *Radiology* editor

search committee. Dr. Langlotz is currently a member of the steering committee

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Curtis P. Langlotz, MD, PhD

New Horizons Lecture Dedicated to Gerald D. Dodd Jr., MD

THE NEW HORIZONS LECTURE was dedicated to the memory of Gerald D. Dodd Jr., MD, a revered leader in the field of diagnostic radiology whose efforts to standardize mammography as a diagnostic tool earned him international acclaim.

Dr. Dodd grew up in New Jersey and attended Lafayette College in Easton, Pennsylvania with plans to study medicine. World War II interrupted his undergraduate studies when he joined the U.S. Navy as a hospital corpsman. After the war, he returned to Lafayette College and graduated in 1945. He went on to receive his medical degree from Thomas Jefferson Medical College in Philadelphia where he also completed his residency.

Dr. Dodd served in the U.S. Air Force during the Korean Conflict, rising to the rank of captain and serving as chief of radiology at Mitchell Air Force Base.

He began his academic career as an assistant professor at Thomas Jefferson Medical College. After 14 years, he left to become professor and the first chairman of the newly formed Department of Diagnostic Radiology at the M.D. Anderson Cancer Center. Over the next 25 years, he distinguished himself as a leader in diagnostic radiology and built the department into an internationally recognized cancer center.

His work to standardize the use of mammography for the detection and diagnosis of breast cancer had international impact and earned him worldwide recognition. Among the many awards bestowed upon

Dr. Dodd were the gold medals of RSNA, the American College of Radiology and American Roentgen Ray Society, as well as the Presidential Medal of the American Cancer Society.

Dr. Dodd passed away September 25, 2015, at 92.



Gerald D. Dodd, Jr., MD

INSIDE WEDNESDAY

MRI Techniques to Reduce Anxiety in Children



Controversy Session presenters discussed alternative methods to using anesthesia during pediatric MRI. **6A**

Identifying Heart Disease Risk Using MRI



Researchers use strain analysis in cardiac MRI to diagnose a rare type of cardiomyopathy. **12A**

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Radiation Safety

American Association of Physicists in Medicine

Tip of the Day

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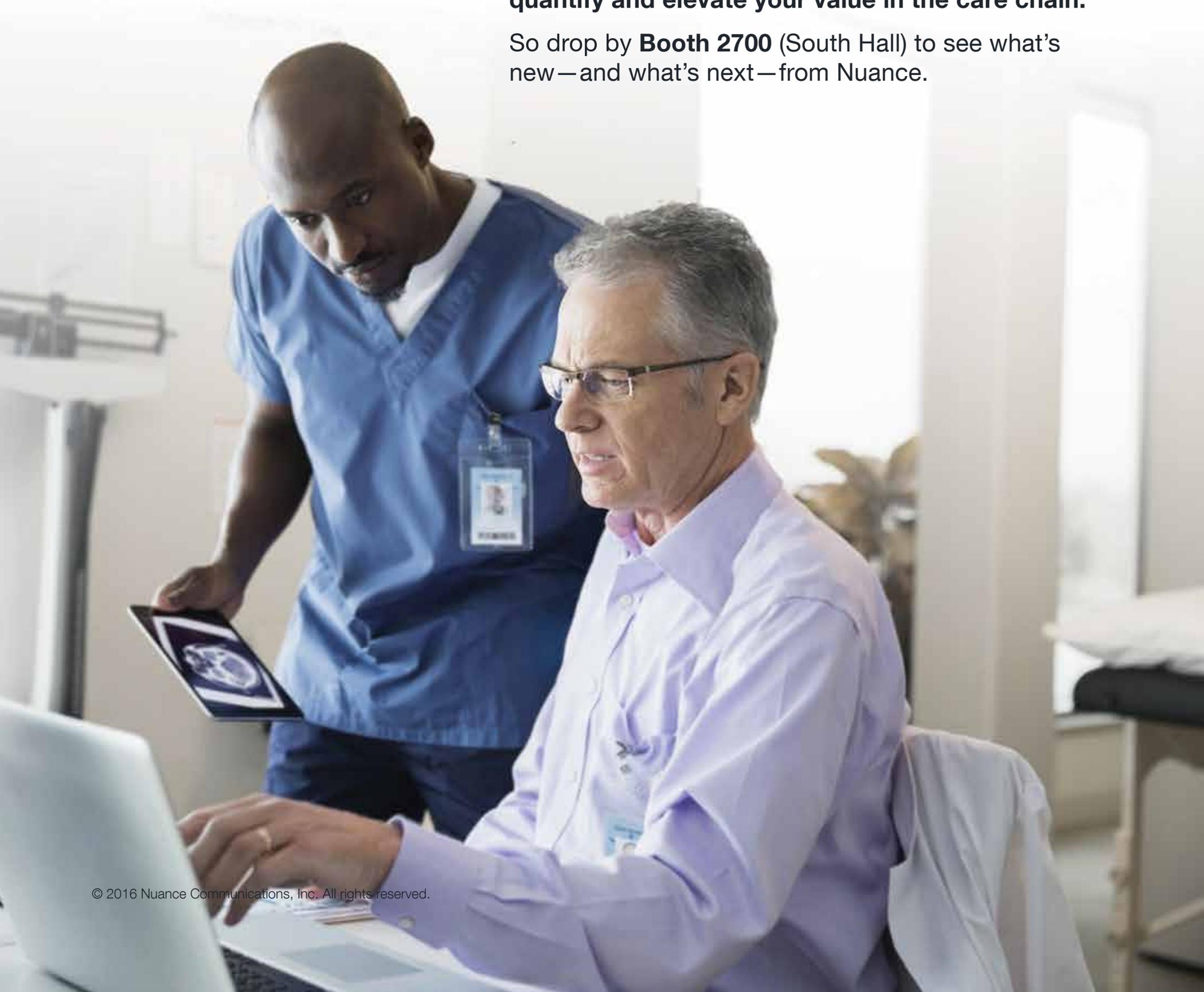


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Wednesday At a Glance

7:15-8:15
Controversy Session: Elementary, My Dear Watson: Will Machines Replace Radiologists? (E450B)
Hot Topic Session: New Informatics Tools in the Era of Managed Care (E451A)
RSNA Diagnosis Live™: Keeping Radiology Weird-Spot Diagnoses from the Pacific Northwest (E451B)

8:30-10:00
Educational Courses
BOOST: Bolstering Oncoradiologic and Oncoradiotherapeutic Skills for Tomorrow

8:30-NOON
Series Courses

10:30-NOON
Scientific Paper Sessions
BOOST: Bolstering Oncoradiologic and Oncoradiotherapeutic Skills for Tomorrow

11:00-1:00
3-D Printing Theater Presentations (Learning Center)

12:15-1:15
Exhibit & Poster Discussions (Learning Center)

1:30-2:45
Plenary Session (E450A)

Annual Oration in Radiation Oncology
Prostate Cancer: Improving the Flow of Research
Colleen A. Lawton, MD

1:30-6:00
Hospital Administrators Symposium (S103AB)
Interventional Oncology Series: Lung and Muskuloskeletal (S405AB)

3:00-4:00
Scientific Paper Sessions

3:00-4:15
BOOST: Bolstering Oncoradiologic and Oncoradiotherapeutic Skills for Tomorrow

3:00-4:30
RSNA-AOSR Joint Symposium (E350)

4:30-6:00
Educational Courses
RSNA Diagnosis Live™: Neuro and MSK (E451B)
Controversy Sessions
Intravenous Contrast Media: Should There Be Any Contraindications to Use? (S404AB)
Emergency Imaging: Is Pain in the Chest a Pain in the Neck? (E450B)
Pelvic Imaging in the Emergency Department: Ultrasound, CT or MRI? (S404CD)



Screening Mammography: Ending the Confusion (E451A)

Head and Neck Controversies ‘Tapas’: Small Bites of Hot Topics in Head and Neck Imaging (E352)

4:45-6:00
BOOST: Bolstering Oncoradiologic and Oncoradiotherapeutic Skills for Tomorrow

View the full program and add sessions to My Agenda on the RSNA 2016 App or at Meeting.RSNA.org.

Daily Bulletin

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 The RSNA 2016 Daily Bulletin is the official publication of the 102nd Scientific Assembly and Annual Meeting of the Radiological Society of North America. Published Sunday, November 27–Thursday, December 1.

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Radiology Should Embrace—Not Fear—the Future

CONTINUED FROM COVER

“When we give them these tools, the sky is the limit,” Dr. Hricak said.

Patient selection for ablation provides an example of the promise of such new methods. For example, the presence of a mutation could predict local recurrence after ablation of lung cancers and liver cancers.

Radiomics — the collective characterization of imaging features — is a key area of development in cancer care that can serve as a predictive biomarker and a tool for the assessment of chemoresistance. Radiomics research on a high grade type of ovarian cancer has shown that the further the metastases are from a tumor, the greater the heterogeneity. This heterogeneity is predictive of a worse outcome. Researchers are linking radiomics with genomics, such as in the correlation of p53 tumor suppressor tumor mutations and phenotypic texture patterns.

Theranostics — the science of developing more specific, individualized therapies for various diseases — represent another area of great promise in the age of precision medicine. Biopsies, for example, will give information on DNA and other molecular factors.

“These are the programs we need,” Dr. Hricak said. “We must realize that nuclear medicine physicians are much more than people reading FDG PET/CT scans — they too need clinics and admitting privileges.”

In closing, Dr. Hricak stressed that radiologists should embrace artificial intelligence and ML as tools to improve efficiency, precision and standardization. Referencing Franklin Delano Roosevelt’s famous quote, “the only thing we have to fear is fear itself,” she said that great opportunities lie in the future.

“Fear is powerful, but we can turn fear into leadership — leadership for the radiology of tomorrow,” she said.

Fear is powerful, but we can turn fear into leadership — leadership for the radiology of tomorrow.

Hedvig Hricak, MD, PhD, Dr (hc)



Radiation Exposure

Question of the Day

Q The NRC dose limit for radiation workers is 50 mSv/yr. How much radiation do flight crews and astronauts get?

[Answer on page 9A.]

Rao is RSNA President-elect

VIJAY M. RAO, MD, IS PRESIDENT-ELECT FOR 2016. A global authority on head and neck imaging, and also recognized for her health services research in radiology, Dr. Rao is The David C. Levin Professor and Chair of Radiology at Jefferson Medical College of Thomas Jefferson University in Philadelphia.



Vijay M. Rao, MD

As president-elect, Dr. Rao will support RSNA’s commitment to innovative initiatives to deliver high-quality educational materials to the radiology community by leveraging digital technology.

“This will be a transformative journey for RSNA,” Dr. Rao said. “In an effort to drive excellence in patient care, RSNA will continue to develop standards for image sharing, structured reports and shared decision making. I find it gratifying to see the RSNA Research & Education (R&E) Foundation increasing grants and awards to support brilliant young radiologists, allowing them to pursue their dreams, which also advances the field.”

A graduate of the All India Institute of Medical Sciences, Dr. Rao has remained on the faculty at Thomas Jefferson University since completing her residency there in 1978. She was appointed associate chair for education in

1989 and vice chair for education in 2000. In 2002, she became the first woman chair of a clinical department in the university’s history. She is a trustee of the Thomas Jefferson University Hospital System.

Dr. Rao has published more than 200 papers, 260 abstracts in medical literature and a dozen book chapters, and she co-edited *MRI and CT Atlas of Correlative Imaging in Otolaryngology*. She is a highly regarded lecturer and educator and has given nearly 200 invited lectures at academic universities and meetings worldwide.

Dr. Rao has served on the editorial boards of multiple journals, including *Academic Radiology*, *Journal of the American College of Radiology* and *American Journal of Roentgenology*. She has also served as a manuscript reviewer for a number of journals. In 2001, she served as editor of *ASHNR News*, a publication of the American Society of Head & Neck Radiology.

An RSNA member since 1981, Dr. Rao has led numerous courses and sessions at RSNA annual meetings and served on the Health Services Policy & Research subcommittee of the RSNA Scientific Program Committee. She has served the RSNA R&E Foundation in a number of roles, and has been a member of the board of trustees since 2008.

Dr. Rao has held committee or leadership positions in a number of major radiologic organizations. In 2014, she was awarded the gold medal of the Association of University Radiologists and the Marie Sklodowska-Curie Award, presented by the American Association for Women Radiologists. Dr. Rao served as RSNA Board chair from 2015 to 2016.

RSNA 2016 Gold Medals Presented



RSNA President Richard L. Baron, MD, presented Gold Medals during Tuesday’s plenary session. Pictured: (left to right) Burton P. Drayer, MD, Dr. Baron, Paul J. Chang, MD, and Robert J. Stanley, MD.

Langlotz Named to RSNA Board

CONTINUED FROM COVER

for the RSNA Digital Roadmap.

His biomedical informatics research laboratory aims to reduce diagnostic imaging errors and improve the accuracy and consistency of radiology communication by developing novel artificial intelligence algorithms that provide real-time assistance to radiologists, clinicians, and patients. In addition to over 100 scholarly publications, Dr. Langlotz authored *The Radiology Report: A Guide to Thoughtful Communication for Radiologists and Other Medical Professionals*, and co-edited *Cancer Informatics: Essential Technologies for Clinical Trials*.

A respected teacher and mentor, Dr. Langlotz and his trainees have been recognized for their contributions to radiology research with numerous scientific awards, including seven best paper awards and five research career development grants.

Dr. Langlotz founded and is a past president of the Radiology Alliance for

Health Services Research, served as chair of the Society for Imaging Informatics in Medicine (SIIM), and as a board member of the Association of University Radiologists. He is a fellow of the American College of Medical Informatics and currently serves as president of the College of SIIM Fellows. He has founded three healthcare information technology companies, most recently Montage Healthcare Solutions, which was acquired by Nuance Communications in 2016.

A St. Paul, Minn. native, Dr. Langlotz received his medical degree, a master’s degree in artificial intelligence and a doctorate in medical information science, all from Stanford University. He completed an internship and radiology residency at the University of Pennsylvania, where he remained on the faculty for 20 years. He accepted his current position at Stanford in 2014.



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MRI Techniques May Reduce Need for Anesthesia in Children

As evidence grows that anesthesia can adversely affect a child's cognitive development, presenters at Tuesday's Controversy Session suggested that radiologists could significantly reduce the time and discomfort associated with pediatric MRI through a variety of measures before and during scanning.

By Richard Dargan

Although MRI is an effective alternative to CT in pediatric imaging that eliminates the risks associated with ionizing radiation, it often requires sedation or general anesthesia to help keep young patients calm and motionless for the exam. Though risks of immediate complications from anesthesia or sedation are generally well appreciated, there is a growing concern about potential risks related to neurotoxicity stemming from anesthetic agents. This toxicity is thought to carry the greatest risk when anesthesia is performed at a particularly young age, for prolonged times and for repeated procedures, said presenter Randall Flick, MD, MPH, an anesthesiologist with the Mayo Clinic in Rochester, Minn.

"In the past 10 to 15 years, a growing body of evidence, primarily from animal studies, shows that the anesthetic agents used in the operating room or sedation suites puts a developing brain at risk for injury," Dr. Flick said.

The Controversy Session, "A New Perspective on Radiation and Sedation Risk in Children: Should ALARA be as 'Low' or as 'Light' as Reasonably Achievable?" was moderated by Donald P. Frush, MD.

Studies on animals suggest that anesthetic agents can affect apoptosis — the process in which cells undergo programmed death as a normal part of brain growth.

"When you expose an animal to anesthetic agents, the number of brain cells that die off becomes much greater, causing deficiencies in the cognitive behavioral



Randall Flick, MD, MPH



Donald P. Frush, MD



Shreyas S. Vasanawala, MD, PhD

ability of those animals," Dr. Flick said.

While the effects of anesthesia on developing brains in animals are well characterized, according to Dr. Flick, the data on children are less clear. Studies have produced mixed results, although the Dr. Flick-led Mayo Anesthesia Safety in Kids (MASK) Study, currently in the data analysis stage, appears to support the association between anesthesia exposure and brain damage.

"These new findings confirm some results that we've seen in past showing an increased incidence of learning disabilities and ADHD in children who were exposed to anesthetic drugs more than once prior to age two," Dr. Flick said.

Taking a Holistic Approach to Imaging

The idea that pediatric patients must be exposed to either radiation from CT or MRI-related anesthesia represents a false

dichotomy, according to study co-presenter Shreyas S. Vasanawala, MD, PhD, of Stanford University in Stanford, Calif. Certain MRI techniques can provide a viable alternative to CT while reducing or even eliminating the need for sedation and anesthesia in pediatric patients, Dr. Vasanawala said.

Efforts should begin in the pre-scanning stage, where the suite can be made to be more child-friendly and a child-life service may be available to help prepare children for the procedure. Dr. Vasanawala suggested that intravenous contrast administration be avoided, if possible, as the process of accessing a vein is often the most

difficult part of the experience for the child. During scanning, silent MRI techniques and distraction devices like DVD goggles may reduce or eliminate the need for sedation.

New and improved MRI approaches produce diagnostic quality images while significantly reducing the time children need to spend in the MRI scanner, Dr. Vasanawala said. For instance, free breathing protocols can provide vital information about the state of the pediatric heart in just 10 minutes. In the abdomen, single MRI shots do an excellent job in suspected appendicitis cases, showing pus and edema and revealing alternative diagnoses like pancreatitis.

Volumetric acquisitions have numerous applications in musculoskeletal imaging, Dr. Vasanawala said, as he showed that a single, six-minute volumetric scan of the pediatric knee revealed findings like

In the past 10 to 15 years, a growing body of evidence, primarily from animal studies, shows that the anesthetic agents used in the operating room or sedation suites puts a developing brain at risk for injury.

Randall Flick, MD, MPH

meniscal tears almost as well as images from a 30-minute acquisition.

"The quality of the imaging is quite good for the diagnostic purposes at hand," Dr. Vasanawala said. "If you try some of these techniques, you can reduce the depth, duration and frequency of [anesthesia]."

Genomics Research Captures the Margulis Award



The fifth annual RSNA Alexander R. Margulis Award for Scientific Excellence was presented by RSNA President Richard L. Baron, MD, (left) to Neema Jamshidi, MD, PhD, on Tuesday in the Arie Crown Theater.

Dr. Jamshidi and colleagues received the award for their research, "The Radiogenomic Risk Score: Construction of a Prognostic Quantitative, Noninvasive Image-based Molecular Assay for Renal Cell Carcinoma," published in the October 2015 issue of *Radiology*. The annual award recognizes the best original scientific article published in *Radiology*.

Working with a team of researchers, Dr. Jamshidi, a clinical instructor in the Department of Radiological Sciences, David Geffen School of Medicine at UCLA, has developed a radiogenomic risk score (RRS) that bridges the gap between quantitative tissue-based molecular data, clinical imaging findings and clinical phenotypes for renal cell carcinoma. The methodology applied to develop the RRS could have useful applications for detecting and tracking other types of cancer and potentially other diseases as well.

"It's really a great honor and total surprise," Dr. Jamshidi said. "I am so thankful that *Radiology* editors recognized our study, as it took many people multiple years to see the results of our research."

The award is named for Alexander R. Margulis, MD, a distinguished investigator and inspiring visionary in the science of medical imaging. Copies of the award-winning article are available in the Membership & Resources area in the Connections Center. The *Radiology* study is available at RSNA.org/Radiology.

Annual Oration in Radiation Oncology Presented Today

Prostate Cancer Focus of Lecture

Colleen A. Lawton, MD, will present the 2016 Annual Oration in Radiation Oncology, "Prostate Cancer: Improving the Flow of Research," today in the Arie Crown Theater.

AS WITH BREAST CANCER for women, prostate cancer for men is the second-leading cause of cancer death in the U.S. This fact alone should cause nationwide concern and result in a push for improved screening and treatment for men plagued with this disease, Dr. Lawton said.

For example, over the past three decades, we have seen screening with prostate-specific antigen (PSA) come and go, and treatment for localized disease improve — but at a relative snail's pace, Dr. Lawton said. Treatment for locally advanced disease has seen progress, but the tempo is generally sluggish and adoption of the advances not universal. Recently there has been a large influx of treatment options for metastatic patients, which is progress, but in the end these patients will likely die of their disease, she says.

In her lecture, Dr. Lawton will review



Colleen A. Lawton, MD

what radiologists have learned from prostate cancer research over the past three decades, including a review of the research on imaging for accurate staging along with research on screening and treatment options.

Dr. Lawton is professor and vice chair in the Department of Radiation Oncology and the associate director of the Radiation Oncology Medical Residency Program at the Medical College of Wisconsin in Milwaukee. She

is also director of clinical operations in radiation oncology at Froedtert Memorial Lutheran Hospital & Medical College Clinical Cancer Center.

Dr. Lawton was one of the original faculty for the RSNA Bolstering Oncoradiologic and Oncoradiotherapeutic Skills for Tomorrow (BOOST) Program. She has also served on the RSNA Refresher Course Committee and as a member of the RSNA Scientific Program Committee Radiation Oncology Subcommittee.

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NOVEMBER 26 – DECEMBER 1



Questions Remain as MACRA Deadline Approaches

By Paul LaTour

Radiologists are facing some urgent questions about where they fit under the new radiology payment policy paradigm, said Ezequiel Silva III, MD, vice chairman of the American College of Radiology (ACR) Commission on Economics, during a presentation Tuesday.

With the Medicare Access and CHIP Re-Authorization Act (MACRA) final rule going into effect Jan. 1, Dr. Silva said the main consideration for radiologists is that the patient experience will be an integral component of future payment structures.

“We have to embrace patient experience. It’s not just terminology to throw around lightly,” said Dr. Silva, a diagnostic and interventional radiologist at

the South Texas Radiology Group in San Antonio.

Classification will determine reimbursement schemes

The first step in radiologists’ process is deciding whether or not to be classified as patient-facing or non-patient-facing within the final rule categorization. The rule was released Oct. 14, but won’t begin affecting payments until 2019. However the performance period under which all physicians will be judged opens in little more than four weeks.

“By mere coincidence, we find ourselves in this room talking about something this complex and yet with that degree of urgency,” Dr. Silva said, referring to the 2,400-page regulatory document defin-

ing the final rule.

According to the new regulations, individual radiologists qualify as patient facing if they bill more than 100 patient-facing encounters per year. In the group-practice reporting option, at least 75 percent of the collective radiologists must reach the threshold for individual radiologists to qualify the group as patient facing.

While the services to be considered patient facing are still in question, Dr. Silva said it is known that evaluation and management (E/M) coding will qualify. However, it’s still not known if procedure codes will be considered patient facing because those codes have yet to be released.

“The implications are not small – this is not a

small differentiation for us to make,” Dr. Silva said.

Changes present opportunity to improve quality of care

Dr. Silva’s presentation was part of a session titled, “Prospering in the Era of Payment Reform.” Geraldine B. McGinty, MD, the former vice chairman of the ACR Commission on Economics, spoke about the need to create a culture of high-value, patient-centered care in radiology during her presentation.

“We have an opportunity to improve our patients’ outcomes by making sure they get the imaging that they need, and making sure they get the right imaging,” said Dr. McGinty, assistant chief contracting officer and assistant professor of radiology at Weill Cornell



Presenters (from left to right) Geraldine B. McGinty, MD, Ezequiel Silva III, MD, and James A. Brink, MD.

Medicine, and assistant attending radiologist at New York-Presbyterian Hospital, both in New York.

The session was capped by James A. Brink, MD, chief of radiology at Massachusetts General Hospital in Boston, discussing radiology’s role in population health management and the triple aim for health reform – better health for the population, better care for

individuals and lower cost through improvement.

“The goal is to keep a patient population as healthy as possible, minimizing the need for expensive interventions such as emergency department visits, hospitalization, imaging tests and procedures,” Dr. Brink said.

Read more about this entire session in the February issue of *RSNA News*.

Experts Advise on Alternative Sources for Research Funding

By Michael Hart and Paul LaTour

Money has never been tighter for early-career investigators looking for ways to fund their research into cutting-edge radiology technology, according to presenters of a Monday Special Interest Session. The National Institutes of Health (NIH) offers fewer funding opportunities every year. Grant-application success with the NIH reached an all-time low of 16.8 percent in 2013.

“NIH funding is essentially flat, especially if you consider inflation. So the issue is how can we take the great ideas from radiologists to fruition,” said Ronald L. Arenson, MD, chair of the radiology and biomedical imaging department at the UCSF and 2015

RSNA president.

Dr. Arenson believes it is time for university researchers to mine the resources of the marketplace rather than more traditional funding sources. But it’s not an easy path.

Much like participants of the popular ABC-TV reality show “Shark Tank,” in which would-be entrepreneurs pitch their investment ideas to a panel of industry titans, participants in the session “Preparing Radiologists to Jump Into the Shark Tank” pitched ideas to a panel of experts.

T. Rockwell Mackie, PhD, pitched his idea for a radiology advancement – an equine CT imaging scanner called Asto CT – to panelists including Dr. Arenson;



Presenters (left to right) Scott A. Penner, Navid Alipour, T. Rockwell Mackie, PhD, and moderator Ronald L. Arenson, MD.

Navid Alipour, co-founder of Analytics Ventures; and Scott A. Penner, an attorney specializing in intellectual property protection with Foley & Lardner LLP.

The panelists offered five important tips for researchers looking for paths to research funding in the marketplace.

First, protect your intellectual property. Make sure you and your university

have the correct patents in place before you schedule the first meeting with a venture capitalist.

“Intellectual property is a valuable asset for your company and sometimes the only asset you have at start-up time,” Penner said. “It needs to be treated as such.”

Next, prepare a good elevator speech. Researchers may not always think

about how they would explain what they’re doing to anybody besides those who speak their own language.

Third, understand where your product fits into the market. When you talk to potential investors, they want a good idea of what the return on their investment would be and why your proposal would be the big hit they’re looking for.

Fourth, decide what your role will be. How much time do you plan to devote to this project you’re asking somebody to invest in? Will you hire staff to take on some of the responsibilities?

And finally, know how much money you will need.

Following these steps will show potential inves-

tors you are prepared and serious about taking your idea to market. But keep in mind, being fully prepared doesn’t mean the money will come easily.

“As venture capitalists, in every situation we’re looking for a reason to say no,” Alipour said, adding the importance of seeing that a person is personally invested in their own idea.

The session was organized by the Academy of Radiology Research, which has proposed a new initiative with the goal of educating imaging investigators about how best to present translational research and technology development ideas to industry and other non-governmental funding sources.

Increased Functional Connectivity in Blind Children

By Mike Bassett

While blind people — as well as other people who have sensory loss — face daunting challenges when dealing with daily life, it is clear that they are somehow able to make adjustments to their sensory loss in order to interact with their environments.

How are they able to do this? Evidence suggests that when the brain is deprived of input from one sensory modality (such as vision), it reorganizes itself to reinforce or boost other senses.

According to Laura Ortiz-Terán, MD, PhD, a research fellow in radiology at Massachusetts General Hospital, that mechanism is

called cross-modal neuroplasticity, in which the brain will recruit other modalities to compensate for the one that is missing.

In the past, Dr. Ortiz-Terán and her colleagues have carried out studies on adults in which they observed that multimodal integration regions are prominent sites of neuroplastic reorganization.

In this study, presented Tuesday, Dr. Ortiz-Terán and her colleagues investigated the network connectivity differences in blind children compared to sighted controls.

Dr. Ortiz-Terán recruited 17 blind children ages 7-12,

and 18 sighted matched controls. Inclusion criteria included active participation in school and normal IQ, while exclusion criteria included having another sensory deficit other than blindness, co-morbid neuropsychiatric conditions, and history of obstetric trauma with cerebral hypoxia.

The study participants were scanned on a 3 Tesla MRI scanner, and following pre-processing, Dr. Ortiz-Terán and her colleagues applied whole brain-weighted-degree connectivity and step-wise connectivity graph theory analyses.

“We found that there is increased connectivity in

these multimodal integration areas in blind children compared to sighted controls,” Dr. Ortiz-Terán said. “Meaning that all the recruitment that they are doing in these unimodal areas is going through those multimodal integration networks.”

In a weighted-degree analysis, Dr. Ortiz-Terán and her colleagues demonstrated that blind children showed enhanced connectivity in the bilateral ventral premotor, middle cingulate cortex/supplementary motor area and right temporal parietal junction. They also found that several of these connectivity changes positively correlated to age.

Using step-wise connectivity analysis, the researchers found that blind children, compared to controls, demonstrated increased functional streams along certain multimodal integration regions, including the anterior insula and temporo-parietal junction bilaterally and the right lateral cortex.

The researchers also used the Allen Human Brain Atlas to investigate whether genetic transcription profiles were associated with the ability of areas of the brain to display adaptive changes after sensory loss.

“We found out that those genes — basically the



Laura Ortiz-Terán, MD, PhD

CREB family — which are expressed only as needed for neuroplasticity, are the ones showing up more in these multimodal brain regions in blind children,” Dr. Ortiz-Terán said. “The neuroplasticity genes involved in learning are more expressed in multimodal integration areas in blind children, which means these children are using these to learn more than sighted children.”

Robotic Navigation Systems Aid Complex Intervention Procedures

Even the most experienced interventional radiologists can improve their performance in complex interventions by using a robotic navigation system, according to research presented Tuesday.

By Felicia Dechter

SUCH SYSTEMS can improve the workflow of complex CT-guided, minimally-invasive ablation procedures and diagnostic punctures in terms of precision and intervention time, according to findings presented by Arman Smakic, MD, a third-year resident at the Institute of Clinical Radiology and Nuclear Medicine University Medical Center in Mannheim, Germany. The system also offers the advantage of eliminating radiation exposure to the performing physician, he said.



Arman Smakic, MD

The study was conducted on 55 patients between September 2015 and March 2016 at the Institute of Clinical Radiology and Nuclear Medicine University Medical Center.

A novel, commercially-available robotic assistance device was evaluated for CT-guided interventions compared to standard manually performed CT-guided interventions in terms of precision, radiation exposure and intervention time. Evaluations were performed with regard to complexity (in-plane vs. out-of-plane interventions) and anesthesia type (general vs. local anesthesia).

The results showed that compared to manual placement, the use of a robotic assistance device in complex out-of-plane CT-guided interventions under general anesthesia allows probe placement with high precision and reduces intervention time with no increase in exposure to radiation to the patient and no radiation to the physician, Dr. Smakic said. In less complex in-plane punctures, no advantages concerning intervention time and radiation dose were demonstrated, while precision analysis showed small advantages, he said.

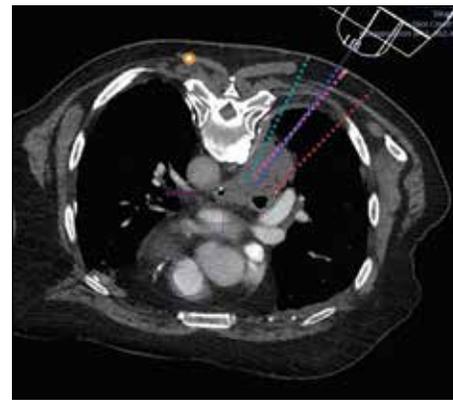
“We were surprised by the very high precision — especially by the very low number of necessary needle replacements — even if we expected solid results since the system is a quite well-engineered product,” Dr. Smakic said. “The most important finding is that even experienced interventional radiologists can improve their performance in complex interventions using a robotic navigation system.”

In addition to benefitting the patient and physician, the hospital profits from faster intervention, which is an economic benefit, Dr. Smakic said.

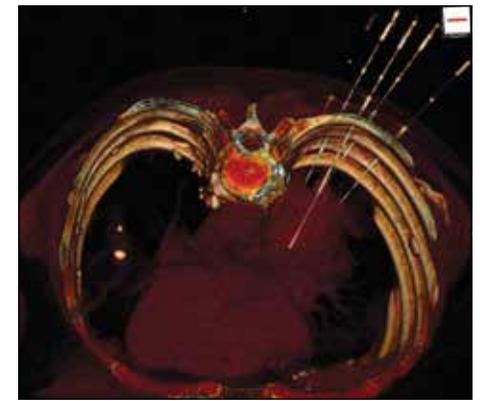
“Of course, this argument can only be accepted if the number of complex interventions is high enough so that the benefit can refund the investment,” said Dr. Smakic.

It’s difficult to say what robotic navigation means for the future of radiology, but there is a good deal of potential, Dr. Smakic said.

“Currently, robotic navigation systems can only support and improve already existing skills,” Dr. Smakic said. “They



Intervention planning of an IRE (irreversible electroporation) of a mediastinal lymph node metastasis. The colored lines indicate the planned needle paths as they will be inserted around the tumor using the navigation system.



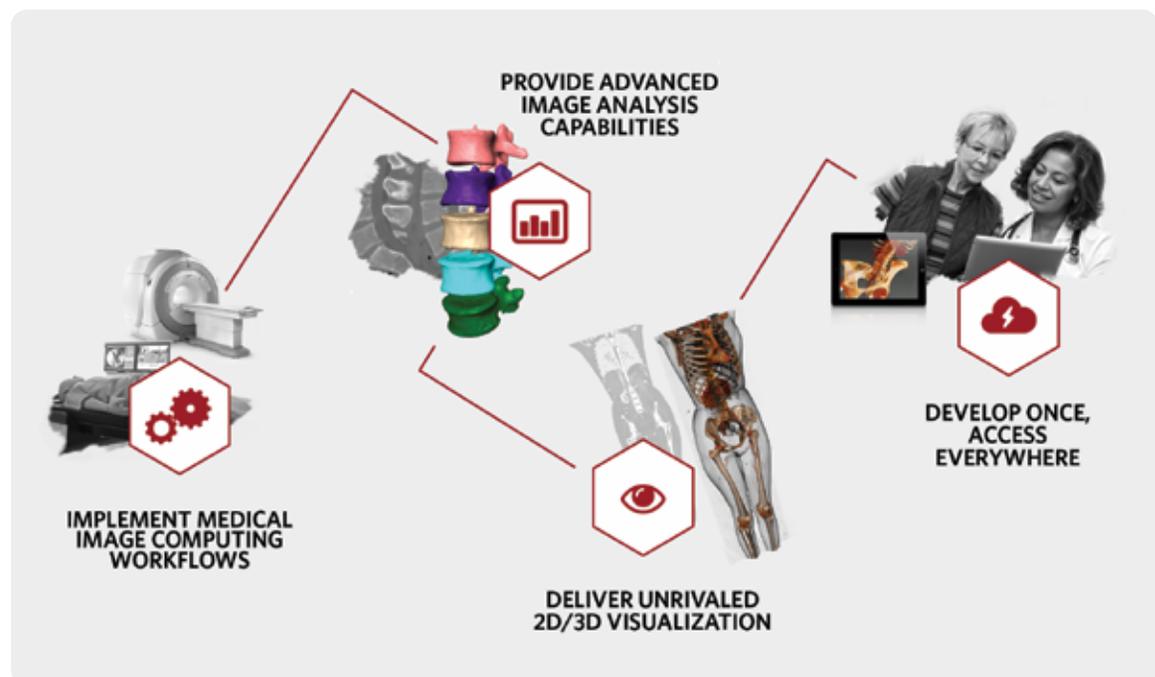
A volume rendering of the CT verification scan after all probes/needles were inserted using the navigation system.

assist the interventional radiologist in order to perform already established interventions.

“Further development of navigation systems may allow radiologists to strike out on new paths and perform interventions that were considered to be impossible,” he said.

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Radiation Exposure Answer
 [Question on page 4A.]
A Typical annual dose for commercial airline flight crews is 2-4 mSv. Typical mission doses on the international space station are 100-150 mSv
 Q&A courtesy of AAPM.

Lessons at the Intersection of Quality Improvement and Informatics

By Mike Bassett

Radiologists are under increasing pressure to demonstrate the value they provide. In a Monday session, “Mission Critical: How to Increase Your Value by Mastering the Intersection of Quality Improvement and Informatics,” presenters offered some suggestions for radiologists and their practices.

Developing a quality improvement plan

David B. Larson, MD, associate professor of radiology at the Stanford University Medical Center, walked the audience through a case study illustrating that in order to achieve quality improvement, informatics is necessary — and critical — but is not nearly sufficient.

This case study involved a quality improvement initiative at Cincinnati Children’s Hospital (where he practiced at the time). “We realized that we just weren’t getting adequate clinical histories from our referring physicians,” Dr. Larson said.

In this case the radiology department turned to its radiologic technologists for help. “They already speak with our patients and families, and work for us and with us,” he explained. “So they should be able to provide us with more control over what information we are getting from referring physicians.”

Dr. Larson and his colleagues decided that a good clinical history protocol should contain three elements: what, when and where. Simply put, clinical histories should describe the nature of the medical event and symptoms, when and for how long it occurred, and where in the patient’s body it occurred.

Working with technologists, the quality improvement initiative went through four phases: launch, support, a transition to sustainability and, finally, maintenance.

An initial audit of clinical histories found that 38 percent met the “who, what, when” criteria. By the end of the 15-week improvement phase, that percentage had increased to 92 percent.

“The main point here is that you just can’t take data and translate that into improvement,” Dr. Larson said. “Data is just a relatively small piece of it.”

Leveraging tools to drive value

In another presentation, Samir B. Patel, MD, director, Value Management Program, Radiology, Inc., reviewed the kinds of quality improvement tools that are available for radiologists.

“A lot of things we require to demonstrate value require technology,” said Dr. Patel. “I’m in a private practice and we don’t have the time or the infrastructure to do things ourselves, so we have to rely on the vendors. RSNA is the perfect venue to talk about this because we have all the vendors here,” he said.

Dr. Patel discussed how radiology departments and groups should be investing in technologies that can increase value, such as structured reporting and tools that can be integrated into PACS, including peer review and critical test results communication.

For example, he noted that the PACS his practice uses has integrated a tool that can identify radiology exams with gender

mismatch information. “Not only do we track this, but every weekday we fix all the gender discrepancies from the previous 24 hours before the bill gets sent out,” he said.

Radiologists should also consider investing in technology tools geared toward structured reporting, Dr. Patel said. His practice uses a CT structured reporting template that enables CT technologists to access a radiology report prepopulated with the study type, technique and patient history taken from the EMR.

This saves time and resources, improves radiology and technologist workflow, and reduces radiologists’ reporting deficiencies. “This is all available now,” Dr. Patel said. “We didn’t magically modify the technology, we just leveraged what the technology provided us.”

Understanding the relationship between informatics and quality improvement

In a third presentation Alexander Towbin, MD, of Cincinnati Children’s Hospital Medical Center discussed lessons for radiologists about how informatics drives quality improvement projects.

The first lesson, Dr. Towbin said, is that all informatics projects are quality improve-



Speakers (left to right) Alexander Towbin, MD, David B. Larson, MD, Richard E. Sharpe Jr, MD (moderator), and Samir B. Patel, MD.

ment projects, but most quality improvement projects are not informatics projects.

Second, a radiology department should always start a quality improvement project with the end in mind, but never start it with a solution.

“There are always a number of ways to get to a solution, but if you think you know the answer, you’ll end up being wrong,” Dr. Towbin said.

The final lesson is that technology does not fix a bad process, but it can simplify a good process.

“Informatics is a tool, it’s not the answer in quality improvement,” Dr. Towbin concluded. “You need informatics to help gather data, and maybe simplify or systematize a process. But informatics is not going to be the answer for everything. You have to do the work first.”

RSNA Introduces 3-D Printing Special Interest Group

In response to breakthrough 3-D printing technology and its implications for radiology, RSNA is proud to introduce a new 3-D Special Interest Group (SIG) to promote the highest quality 3-D printing for medical applications via education, research and collaboration.

The SIG, chaired by Frank J. Rybicki, MD, PhD, will focus on maintaining a prominent role for radiologists in this diverse and growing specialty. The group will also seek to provide physicians and allied health scientists with optimized education and research programs.

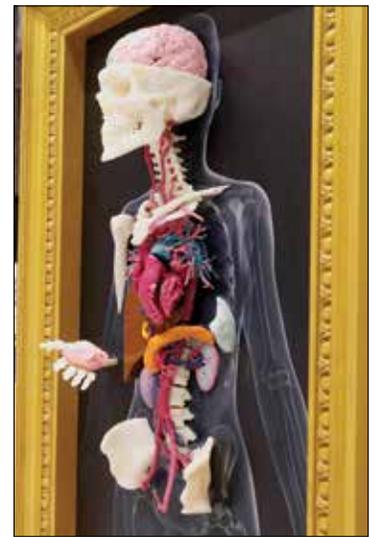
“Among the goals of the SIG are to include and help define leaders in 3-D printing and act as ambassadors of our growing field for RSNA. The SIG is designed to be a valuable resource for medical 3-D printing, connecting our members in education, sharing best practices to formalize guidelines, exchanging cutting edge techniques and technologies in the field, and serving as a forum to share our successes and

collaborate on solving our challenges,” Dr. Rybicki said.

RSNA members in good standing may simply call the RSNA Membership Department to add 3-D Printing SIG participation to their membership for a fee of \$40 per year.

Current RSNA membership is required to join the 3-D Printing SIG. Please call the Membership Department at 1-877-776-2636 to learn more or apply online at RSNA.org/Apply.

Learn more about the group at RSNA.org/3D-Printing-SIG.



The new 3-D Printing in Medicine exhibit in the Learning Center showcases the increasing clinical significance of 3-D printing and its connection to medical imaging, including presentations, posters and a demonstration area.

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Telerobotic Ultrasound System May Improve Access to Care in Underserved Areas

By Lynn Antonopoulos

THE USE OF A telerobotic ultrasound (US) system allows sonographers and radiologists to perform US exams remotely with minimal training and set-up. The approach may provide an opportunity to establish remote US clinics in areas lacking skilled sonographers and radiologists.

“Telerobotic sonography may facilitate routine studies, after-hours sonography for emergent cases, or access to subspecialized sonography which would otherwise not be available,” said Scott J. Adams, a medical student at the University of Saskatchewan College of Medicine.

In an initial study, Adams and his team assessed the ability of the system to generate diagnostic-quality images. In addition, they sought to determine whether the method was acceptable to patients and sonographers. Using a standardized abdominal imaging protocol with a group of 18 patients, they first performed conventional sonography. Then, they repeated the exams using telerobotic sonography. Patients in the imaging clinic were scanned remotely by a sonographer communicating with a patient-site assistant via a videoconferencing system and a non-dedicated internet connection between the two sites.



Scott J. Adams

The patient-site assistant guided gross movements of the robotic arm based on instructions from the sonographer 2.75km (1.7 miles) away. “The patient-site assistant had no previous experience with ultrasound and did not have a healthcare background,” Adams said.

The sonographer operated a mock probe and touchscreen monitor, which displayed the US interface to remotely control all settings and fine movements of the transducer.

The conventional exams were read independently from the telerobotic exams, and the results were encouraging. Ninety-two percent of the organs visualized using conventional sonography were also sufficiently visualized robotically. A paired sample t-test showed no significant difference between the two modalities in measurements of the liver, spleen and diameter of the proximal aorta.

Telerobotic assessments overestimated distal aorta and common bile duct diameters while underestimating kidney lengths (p-values <0.05), but these differences were considered clinically insignificant. Five pathological findings were successfully identified using both modalities. Three pathological findings were seen only through conventional methods while two were seen only telerobotically.



A sonography room at an imaging clinic (“patient-site”) was equipped with the ultrasound system and robotic arm. An assistant (“patient-site assistant”) with no prior ultrasound experience guided gross movements of the robotic arm based on instructions from the sonographer.

According to Adams, sonographers and the patient-site assistant readily developed effective communication strategies with each other. Though it was slightly more challenging to position the probe for an optimal view for measurement, they successfully coordinated gross placement of the robotic arm. He noted, “The average duration of the telerobotic examinations was longer than that of conventional examinations, though the duration continued to decrease as sonographers gained experience using the telerobotic system.”

Following the exams, all patients agreed they would be willing to undergo a telerobotic examination again. They were comfortable communicating with the sonographer using the video conferencing system and were comfortable with the fact



At an academic health sciences center 2.75 km away (“sonographer-site”), a mock probe and touchscreen monitor which displayed the ultrasound system interface enabled the sonographer to remotely control all settings and fine-movements of the transducer. A non-dedicated internet connection connected the two sites, and a videoconferencing system allowed for communication between the sonographer and the patient and patient-site assistant.

that a sonographer at a distant location was controlling the US probe.

Looking ahead, Adams and his team have begun recruiting subjects for a new study assessing the potential for telerobotic US use in routine obstetrical studies. They are also deploying two additional telerobotic US systems in remote communities in Saskatchewan to be serviced by sonographers at the group’s central US clinic. “We believe a network of remote US clinics will fill an unmet need in providing timely access to ultrasound services in rural, remote or low-volume centers,” said Adams.

A Strategy for Success is Critical to Avoiding Failure

By Felicia Dechter

ON THE ROAD TO becoming a successful practitioner and leader, anticipating — and learning to avoid — obstacles that could derail performance is key, according to a Tuesday presenter.

Pitfalls and problems commonly encountered in performance improvement and strategies to avoid them was discussed by David B. Larson, MD, MBA, associate professor of Pediatric Radiology, associate chairman for Performance Improvement in the Department of Radiology at Stanford University, during a Tuesday session.

Improvement projects can create uncertainty among team members who may know the current and desired performance level, but often don’t know how to achieve their goal, Dr. Larson said. In other words: They know where they are and where they want to be, but they don’t know how they are going to get there, Dr. Larson said.

“Like with most worthwhile endeavors, there are probably more ways for an improvement project



David B. Larson, MD, MBA

to go wrong than for it to go right,” said Dr. Larson, a 2014 RSNA Honored Educator Award recipient. “But different types of missteps often result in similar types of undesired outcomes, similar to the human body in which different types of causes of diseases can result in similar symptoms, so it can be hard to understand what caused things to go wrong.”

Dr. Larson focused on the factors he uses to predict the likely suc-

cess of an improvement project: leadership, method, resources, culture and execution. These five factors should be familiar to every QI (Quality Improvement) leader, he said.

Leaders should strive to set the vision for improvement, model desired behavior, empower the right people, address skeptics and mobilize resources, Dr. Larson said. “When leadership support fails in any of these areas, the project is likely to fail,” he said.

Performance improvement has a well-developed methodology, Dr. Larson said.

CONTINUED ON PAGE 14A

Texas Medical Center Transitions to MRI in Diagnosing Children with Appendicitis

By Elizabeth Gardner

BECAUSE EARLY appendicitis in children can be challenging to diagnose, most practices use a CT scan if an initial ultrasound (US) proves equivocal. But Texas Medical Center (TMC) has had such success getting children to hold still long enough to get good MR images, the facility has entirely replaced CT with MRI for this purpose.

A Tuesday presentation on the hospital’s transition offered guidelines on how to make a familiar diagnosis using a less familiar imaging modality.

“It’s possible to place a pediatric patient in an MRI environment and obtain high-quality images in almost all patients, which surprised me,” said Larry Kramer, MD, professor of diagnostic and interventional imaging at the University of Texas Health Science Center at Houston.

Challenged by his department chair to reduce radiation exposure in children, Dr. Kramer’s team used a combination of a rapid free-breathing protocol and an algorithm to correct for motion to produce

images that diagnose appendicitis just as accurately as CT. In deference to the requirements of the emergency department (ED), the protocol does not use either oral or intravenous contrast agents, nor does it require sedation.

The full study can take anywhere from 10 to 30 minutes depending on the size of the child. The protocol is designed for children as young as four years old.

“We don’t ask them to do anything except hold still and breathe normally,” Dr. Kramer said. So far, 95 percent of the studies performed under the protocol have yielded diagnostic quality images.

Identifying the Elusive Appendix

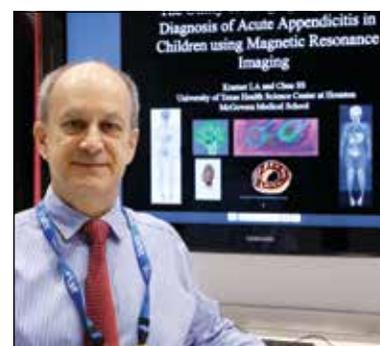
Some centers that use MRI for appendicitis diagnoses use two-plane protocol, but for now, TMC is taking images on coronal, sagittal and axial planes, because two planes often aren’t enough to find an elusive appendix, Dr. Kramer said.

However, learning to read the studies initially presented challenges. “Residents and other faculty and myself were strug-

gling with being able to identify the appendix, because it’s a small structure in a large area with a lot of other bowel loops and structures,” Dr. Kramer said.

Image readers who couldn’t immediately identify the appendix would look for secondary signs of appendicitis, but those often aren’t present in early stages and readings can result in false negative findings. However, over time, Dr. Kramer began to identify novel descriptors for identifying and characterizing acute appendicitis, which aids in disease pattern recognition.

His presentation included images that illustrate those descriptors, including a “spectacle” pattern that indicates a looped or kinked appendix and a “dripping candle wax” pattern that indicates fluid flowing away from the appendix.



Larry Kramer, MD

Dr. Kramer estimated that it took about six months for him to learn to detect the appendix consistently on MR images, and that same length of time to determine the signs of a false negative. “The learning curve was probably over 50 cases,” he says.

TMC has used the MR technique in almost 300 cases since switching protocols in 2013. Dr. Kramer estimated that residents still fail to identify the appendix in 10 to 15 percent of cases, but he expects further improvement with more practice.

TMC has not encountered any false positive diagnoses, and has been able to use the MR protocol both to rule out appendicitis and to identify other abdominal problems, such as mesenteric aneditis, which usually subsides without treatment.

Costochondral Fractures Related to Higher Mortality Rates in Blunt Polytrauma Patients

Patients with costochondral fractures (CCfx's) have a slightly higher mortality rate than thoracic trauma patients with no CCfx's and may require closer examination, according to findings presented in a Tuesday morning session.

By Lynn Antonopoulos

Speaker Mari Nummela, MD, fellow in musculoskeletal radiology at Helsinki University Hospital, shared the results of a recent study comparing the 30-day mortality rate between blunt chest trauma patients with and without CCfx's. She noted that the fractures serve as a marker of high-energy trauma and coincide with a significant number of concomitant, intra-abdominal injuries which may cause complications in patient recovery.

MRI is the preferred modality for detecting isolated CCfx's commonly found in athletes, however Dr. Nummela said that the fractures are also common in other trauma mechanisms and readily detectable via CT when CT study is indicated. Polytrauma patients frequently have pulmonary and mediastinal injuries initially. CCfx's are regularly seen in cases of severe rib cage injury and cause thoracic instability contributing to more serious conditions like the formation of flail chest.

While chest wall treatment is typically conservative, for patients with CCfx's and impaired respiratory function, aggressive respiratory support and analgesia protocol may be necessary. Dr. Nummela recommended paying close attention to the presence of CCfx's and said, "Awareness of the costal cartilage fractures and their impact on rib cage instability might affect treatment decisions."

Dr. Nummela and her team reviewed whole body CT (WBCT) scans from 1,461 patients with a history of blunt force trauma, primarily motor vehicle accidents and falls, in a level one trauma center over a period of 36 months. Thoracic injuries were present in 574 patients, and of those 118 (20 percent) had a total of 226 CCfx's categorized as costochondral, midchondral or costosternal. The most common injuries occurred in costal cartilages of ribs 6 and 7.

The incidence of CCfx's in all WBCT studies was 8.1 percent and 20.6 percent in thoracic trauma patients. The fractures were more common in blunt chest trauma patients than Dr. Nummela and her team anticipated. "As radiologists, both residents and specialists, we tend to overlook costal cartilage fractures in polytrauma patients," she said, adding, "Especially injuries in the subcostal angle...often remained initially undetected in this cohort."

Multiple bony rib fractures occurred in 96 cases (81.4 percent), and of those, 42 cases had bilateral fractures. While no cor-



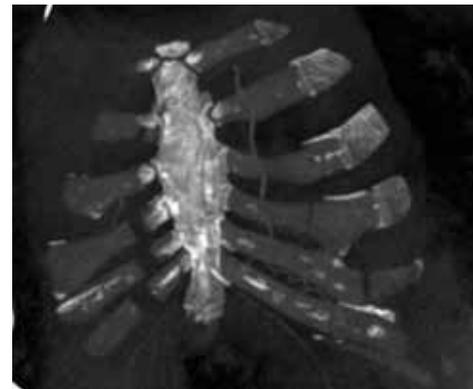
Mari Nummela, MD

relation was found between costochondral calcifications and fractures, Dr. Nummela said calcifications were present adjacent to or along the fracture line for several patients on follow-up CT and may contribute to continued instability of the chest wall over time.

The team also examined data for associated intrathoracic injuries and found 77 cases of pneumothorax, 62 cases of hemothorax and 62 cases of pulmonary contusions. Intra-abdominal injuries were seen in 29 patients. No internal mammary or subclavian artery injuries were located, and acute aortic injury was rare.

The 30-day mortality of patients with CCfx's was slightly higher than patients without CCfx's (7.63 percent compared to 4.61 percent). Traumatic head injury was the most common cause of death during the first 30 days after trauma in the cohort.

Dr. Nummela said the retrospective data collection was time-consuming and labor-intensive yet very educational. She acknowledged that the 30-day mortality between blunt chest trauma patients with and without CCfx's did not prove a direct correlation between the fractures and mortality. "The clinical significance of cartilage fractures alone was difficult to determine," she noted adding, "A follow-up study with a larger sample size could possibly establish a more direct correlation between CCfx's and raised mortality."



A 64-year-old male who was hit by a car presents with bilateral serial costochondral fractures and sternum fracture. CT follow up study seven days after trauma showed increased dislocation of costal cartilage fractures (top), (coronal CT image, MIP 20 mm). Failure to wean from respirator resulted in operative fixation, postoperative supine chest x-ray at the ICU (bottom).

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A Strategy for Success is Critical to Avoiding Failure

CONTINUED FROM PAGE 13A

While there are different flavors, they all follow a similar pattern. These methods are closer to the engineering design process than to the scientific method; it is fairly straightforward but not always intuitive, Dr. Larson said.

"Project teams can flail — and fail — if they do not have at least some training in improvement methods," he said.

Additionally, dedicated improvement projects tend to attack problems that are not easily solved with intuition alone, Dr. Larson said. This means they require investments in thought, discussion, expertise, and often investment in new tools, infrastructure and roles, he said.

"This requires protected time and resources," Dr. Larson said. "Expecting to tackle a difficult problem without the corresponding investment is likely to result in failure."

Anticipating Pitfalls Helps Avoid Them

An organizational culture can be defined as having shared beliefs, values and assumptions that drive behavior on a daily basis. Since most performance improvement requires the individual to change in some way, if individuals in the organization do not have a history of collaboratively solv-

ing problems, then an improvement project may fail because it meets predictable resistance, or "antibodies," he said. Teams that do not have a change management strategy tend to fail, Dr. Larson said.

There is an entire field of study and practice devoted to project management, Dr. Larson said. While its tenets are relatively straightforward (define the tasks to be done, designate those responsible and plan, carry out, and follow through on these tasks), doing it effectively is difficult, he said. "It has been said that success is 10 percent idea and 90 percent execution," Dr. Larson said.

Most pitfalls fall into one of these categories, Dr. Larson said. Those who have thought these factors through and have anticipated pitfalls are much less likely to be caught off guard and more likely to be successful, he said.

In 'The Art of War,' Sun Tzu said that the general who wins a battle makes many calculations before the battle is fought and the general who loses a battle makes but few calculations beforehand, Dr. Larson said. "In this way, the likely winner can be foreseen. So it is with improvement projects."

NCI IMAGE PERCEPTION RESEARCH

Researchers supported by the National Cancer Institute (NCI) will be conducting studies on radiologic image perception in an open lab environment at RSNA 2016. RSNA meeting attendees can learn about this important area of research and, if they wish, participate in the studies as volunteers in this lab environment. Nine different laboratories from the U.S., Canada and Australia have been selected by NCI to conduct the radiological image perception studies.

The lab is equipped with four testing stations and eye tracking equipment and is staffed by laboratory personnel. Located in the back of the Learning Center (near the Resident & Fellow Lounge), the lab is open through Thursday, from 7:30 a.m. to 6 p.m. Attendees can sign up at <https://goo.gl/joWhff>.

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