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

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

A renowned leader in oncologic imaging, Dr. Hricak asserted that fear of new technologies like machine learning (ML) is 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 receptor 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.

CONTINUED ON PAGE 4A

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.

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 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.

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 chair 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.

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 Imaging Network.

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 LOINC-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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Radiology Should Embrace—Not Fear—the Future

“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.

“One of the most important things we can do is to recognize this fear and turn it into something positive,” Dr. Hricak said.

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 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 for 20 years. He served as editor of Roentgenology, Journal of the American College of Radiology and Clinical Imaging: Essential Technologies for Clinical Trials.

Langlotz Named to RSNA Board

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 informatics 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, it 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 ‘Light’ as Reasonably Achievable?” was moderated by Donald P. Frush, MD, MPH, anesthesiologist with the Mayo Clinic in Rochester, Minn.

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“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.”

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.

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 Oncodiagnostic 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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Radiologists are facing some important questions about where they fit under the new radiation 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, an interventional radiologist at New York-Presbyterian Hospital, both in New York.

The session was capped by James A. Brink, MD, chief contracting officer 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, referring to the 2,400-page regulatory document defining 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 experience is the key. “It’s about validation 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 contract officer and assistant professor of radiology at Weill Cornell Medicine, and assistant attending radiologist at New York-Presbyterian Hospital, both in New York.

“The session was capped by James A. Brink, MD, chief contracting officer at the South Texas Radiology Group in San Antonio.”

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 we can 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 task,” he said.

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 Ato CT – to panelists including Dr. Arenson; 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 a presentation with a venture capitalist.

“Intellectual property is a valuable asset for your company, but 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 marketplace. 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 will you need. Following these steps will show potential investors 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 the idea 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 they return to 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 sight is taken away, a significant input from one sensory modality (such as vision), it reorganizes itself to reinforce the remaining input, to reinforce the existing. 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 in 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 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. The demographic criteria included having another sensory deficit other than blindness, co-morbid neuro-psychiatric conditions, and a 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 uni-modal areas is going through these multimodal integration networks.”

In a weight-degreed 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 temporoparietal 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
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.

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 for 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 benefiting 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 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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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 contain three elements: what, when and where. “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 improvement 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 Antonopoulou

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 Texas Health Science Center at Houston.

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.

The patient-site assistant guided 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 path sample t-test showed no significant difference between the two modalities in measurements of the liver, spleen and diameter of the proximal aorta.

Telerobotic assessment underestimated 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 radiography, 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 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. Those who were comfortable communicating with the sonographer using the videoconferencing system and were comfortable with the fact 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 Saskatchewen 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.

Performance improvement has a well-defined process, 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.

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,” said Dr. Kramer.

“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 diagnosis use a two-planar 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 struggling 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.

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 aneditsis, which usually subsides without treatment.

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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.

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 anesthesia 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 correlation 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 Strategy for Success is Critical to Avoiding Failure

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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 fail — 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 solving 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 those 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 few calculations beforehand, Dr. Larson said. “In this way, the likely winner can be foreseen. So it is with improvement projects.”

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).

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 radiologic 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/joWhrf.
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