**Radiology Offers Lessons to Entire Medical Industry for Digital Transformation**

By Paul LaTour

Because it experienced a digital transformation early, radiology serves as the "canary in the coal mine" for the rest of the medical industry, according to Robert M. Wachter, MD, who delivered an opening session lecture Sunday in Arie Crown Theater.

"Radiology tends to be first in these areas, so it has many lessons for the rest of us," said Dr. Wachter, during his presentation, "Hope, Hype and Harm at the Dawn of Medicine's Computer Age." He notes in the book that the demise of radiology rounds in hospitals has become an unintended consequence of digitalization of images and PACS.

“When I was a medical student, there was no question the central hub of the hospital was the radiology reading room,” said Dr. Wachter, who was ranked the most influential physician-executive in the U.S. by Modern...

CONTINUED ON PAGE 11A
Accelerating radiology from solo to synergy.
Beyond words.

We’ve earned our reputation as the industry’s most dynamic innovator, and we don’t plan to stop now. Or ever.

Today, Nuance delivers image and data solutions that not only improve reporting accuracy, speed and efficiency but also enable you to demonstrate, quantify and elevate your value in the care chain.

So drop by Booth 2700 (South Hall) to see what’s new—and what’s next—from Nuance.
BUILT FOR MRI

1.5T and 3T MRI access for implantable cardiac device patients* thanks to SureScan™ Technology.

Visit MRISureScan.com for more information.

Stop by Medtronic booth #7409 North — Hall B for information on the benefits and risks of these products.
New Techniques Help Correct Metal Artifacts in CT Images

More and more patients have metal implants that impede the accurate reading of their CT scans, either by blocking the x-rays or by creating artifacts that obscure the image.

By Elizabeth Gardner

Software is making advances in helping to correct artifact issues caused by the implants, but some correction techniques work better than others, depending on the type of implant and the type of study, according to a research team at the Mayo Clinic in Rochester, Minn.

"Metal artifacts are the most challenging unsolved problem in the 40-year history of CT scans," said Mayo medical physicist Lifeng Yu, PhD.

Artificial joints, amalgam tooth fillings and other metal objects can block the view of the surrounding tissue. The metal itself can also create data inconsistencies from beam hardening, photon starvation, non-linear partial volume effects and beam scattering. These inconsistencies can cause severe streaking and shadow artifacts, making it difficult for radiologists to use the images for diagnosis or to have confidence in their readings.

"When we try to look at structures in the head, a dental amalgam filling can shoot a star artifact that obscures the area," said Mayo medical physicist James Kofler, PhD. "You could tilt the gantry or move the body to keep the amalgam out of your field of view, but that's not always possible."

Removing the artifacts via software is the next best thing, he said.

In a poster on display all week at RSNA 2016, Mayo researchers made detailed comparisons of two techniques for correcting images that include metal implants: iterative metal artifact reduction (iMAR), and dual-energy virtual monochromatic imaging. The project also combined the two techniques in processing a third set of images. Most CT manufacturers have introduced some type of metal artifact reduction software that can be used directly from the scanner console.

The team acquired dual-energy CT images of hip, knee, spine and dental implants and also used images taken from patients who had each type of implant. They did post-processing of each set of images using both iMAR and virtual monochromatic imaging.

iMAR identifies the areas that contain metal-contaminated data and either weights those areas less or replaces the data with data from adjacent areas that aren't contaminated. Virtual monochromatic imaging takes advantage of differences in contrast and spectral information between low-energy and high-energy scans, and uses those differences to adjust the weighting factor for areas that have metal artifacts. The latter method is particularly effective in reducing beam hardening artifacts, though scatter and photon starvation artifacts can still remain.

The team's results showed that iMAR did a better job of eliminating artifacts for hip and knee implants, while for dental implants, iMAR actually introduced new artifacts. In that case, dual-energy virtual monochromatic imaging was more effective. For spine implants, the combined method was most effective. However, in all cases, radiologists must keep the original images next to the corrected ones for comparison. "While the processed images are a great improvement over the originals, the techniques are still not perfect, and the final outcome is case by case," Dr. Yu said.

Metal artifacts are the most challenging unsolved problem in the 40-year history of CT scans.

Lifeng Yu, PhD

In their research, Mayo Clinic presenters including Michael R. Bruesewitz, RT(R) (above), compared two techniques for correcting images containing metal artifacts. The poster can be viewed all week from 8 a.m. to 5 p.m. in the Physics Community at the Learning Center.

QI Storyboard Poster Walk, 3 to 4 p.m.

QI Storyboard Poster Walk, 3 to 4 p.m.

Learn About ECOG-ACRIN Breast Cancer Trial Recruitment at RSNA 2016

Medical Imaging providers will have the opportunity to sign up to participate in a new, large-scale breast cancer screening trial funded by the National Cancer Institute. The first such study in nearly 25 years, the Tomosynthesis Mammography Imaging Screening Trial (TMIST), led by the ECOG-ACRIN Cancer Research Group, will begin in mid-2017.

TMIST will enroll 165,000 asymptomatic women in the U.S. and Canada to compare screening results of breast tomosynthesis vs. standard digital mammography.

RSNA meeting attendees can learn about how their medical facilities can participate by attending one of two sessions during RSNA 2016. Visit http://bit.ly/2exy906 for more information about the trial.

» Monday, Nov. 28, 1:30–2:30 p.m., Room W470A
» Wednesday, Nov. 30, 11:00 a.m.–noon, Room W192BA

Technology

Question of the Day

What correction factors do I need to convert CT/dose to dose?

[Answer on page 13A.]
Over 1,700 Organizations Rely on Bayer for Dose Management

Bayer’s Radimetrics™ Enterprise Platform is the leading choice—with tools that can help you achieve your goals and experienced support to help you along the way.

- The first integrated contrast* and radiation dose management solution, enabling a comprehensive view of data for compliance and personalized care
- A nationwide team of over 200 delivery, training, and support specialists guiding your organization to a successful implementation
- “Bayer is by far the most widely adopted dose system on the market—no other system’s install base is close”†

“Bayer led the way in our implementation with a highly experienced team that addressed my needs. Now I’m starting to see great results, and I’m excited about continued success.”

Bethany Miller
Lead Cross-sectional Anatomy Technologist, RT (R) (CT) (BD)
Brattleboro Memorial Hospital

VISIT us at RSNA to learn more: South Hall #2529
LEARN more and schedule a one-on-one demo: RSNA.bayer.com

* Requires the Certegra® Workstation and the Medrad® Stellant® CT Injection System.
RSNA 2016 Honorary Members

Honorary Membership is presented for significant achievements in the field of radiology. Today, at the beginning of the Monday Plenary Session, RSNA will award three honorary memberships.

Luis Donoso-Bach, MD, PhD
A celebrated diagnostic radiologist, researcher and inventor, Luis Donoso-Bach, MD, PhD, has earned an international reputation as a leader in building relationships with radiologic societies across the globe and as a pioneer in creating the virtual radiology conference. Currently, Dr. Donoso-Bach serves as the director of the Diagnostic Imaging Department at the Hospital Clinic of Barcelona and as professor of radiology at the University of Barcelona — positions he has held since 2006. Dr. Donoso-Bach earned his medical degree in 1981 from the School of Medicine of the Autonomous University of Barcelona and his doctorate degree at the University of Barcelona — positions he has held since 2006. Dr. Donoso-Bach earned his medical degree in 1981 from the School of Medicine of the Autonomous University of Barcelona and his doctorate degree at the University of Barcelona — positions he has held since 2006. Dr. Donoso-Bach served as vice president of the Spanish Society for Diagnostic Radiology from 1998 to 2002 and as president from 2002 to 2006. Since 2000, he has served the European Society of Radiology (ESR) in various capacities and is the current ESR immediate past president.

Carlo Bartolozzi, MD
A preeminent researcher, educator and innovator, Carlo Bartolozzi, MD, has made invaluable contributions to gastrointestinal and abdominal radiology, and shaped the careers of a generation of radiologists in his native Italy and beyond. Dr. Bartolozzi earned his medical degree from the University of Padua in 1972 and completed his residency in 1977. He became an associate professor of radiology at the University of Padua in 1980 and professor and chair of the Department of Radiology at the University Hospital of Pisa in 1990 — a position he has held until his retirement in 2015. Also at the University Hospital of Pisa, Dr. Bartolozzi served as director of the Department of Diagnostic and Interventional Radiology and Nuclear Medicine from 2004 to 2015 and as the director of the Department of Oncology, Transplants and Advanced Technologies in Medicine from 1999 to 2007.

Dr. Bartolozzi’s research in gastrointestinal and abdominal radiology has advanced innovative techniques such as microbubbles in ultrasound, perfusion imaging in multislice CT, and MR elastography for liver imaging. As chairman of the Department of Radiology at the University of Pisa since 1990, he has taught hundreds of residents and fellows during his lengthy career. He has served as president of the European Society of Magnetic Resonance in Medicine and Biology in 2000 and as president of the European Society of Gastrointestinal and Abdominal Radiology (ESGAR) in 2005.

Dr. Bartolozzi’s honors include receiving the ESGAR gold medal in 2009 and the highest recognition of the University of Pisa — the Order del Cherubino (the Order of the Cherubini) — in 2011.

Osamu Matsui, MD, PhD
Osamu Matsui, MD, PhD, is a world-renowned researcher, educator and innovator who has significantly advanced the detection and treatment of liver cancer. He has also forged a unique path in publishing, serving as the first editor-in-chief of the Japanese Journal of Radiology. Dr. Matsui earned his medical degree from Kanazawa University Faculty of Medicine, Japan, in 1972, and his doctoral degree from the university in 1986. He spent his entire career at Kanazawa, beginning as an assistant professor and holding the positions of associate professor, full professor and chair of the Department of Radiology, Kanazawa University Hospital and Faculty of Medicine.

He served as vice president of Kanazawa University Hospital and dean of Kanazawa University Graduate School of Medical Sciences before officially retiring in 2013. He remains on staff as a professor emeritus at Kanazawa University.

Dr. Matsui’s research has focused primarily on diagnostic imaging and interventional radiology, with an emphasis on liver cancer. He developed revolutionary techniques that broke new ground in detecting and treating liver cancer.

As an educator, Dr. Matsui trained and educated more than 200 young radiologists in the Hokuriku region of Japan where radiology was practically nonexistent as a specialty even three decades ago.

Serving from 2006 to 2010 as the first editor-in-chief of the Japanese Journal of Radiology (the official journal of the Japan Radiological Society [JRS]), Dr. Matsui oversaw the journal’s transition to an English-language publication.

He served as JRS president in 2007, as president of the annual meeting for the Japanese Society of Interventional Radiology in 2007, as president of the Japanese Society of Abdominal Radiology from 2003 to 2013, and as the first president of the Asian Society of Interventional Radiology.

Among his many honors, Dr. Matsui was awarded gold medals from the Japanese Society of Abdominal Imaging, Asian Society of Abdominal Radiology and Asian Pacific Society of Cardiovascular and Interventional Radiology.

Special Interest Sessions Highlight Current Issues in Radiology

The RSNA Board of Directors has determined these courses to be of particular importance, and increased audience interest is expected. All courses are presented from 4:30 to 6 p.m. today.

SPSI21: Global Medical Radiation Campaigns: Image Gently, Image Wisely and EuroSafe: Is All This Still Necessary?
Room E353AB
Presenters will review the continuing need for educational campaigns and provide insights for organizational success of such campaigns. They will discuss the impact to date of the Image Gently®, Image Wisely® and EuroSafe campaigns and report on the Dose Index Registry.

SPSI22: A New Model of Patient Care: Value over Volume—a RAD Talk
Room E354AB
This session provides tools to align radiology practices with the value-over-volume approach to patient care. Hear case presentations of a patient and radiologists about the importance of patient-centered care and how to make changes to your practice.

SPSI23: Imaging Cognition 2016: Psychosis
Room E350
Presenters will define the clinical features of psychosis and schizophrenia, describe the underlying biological abnormalities and discuss how advanced imaging techniques can assist in the evaluation of patients with psychosis. A panel discussion will address the role of imaging in research and patient care with an emphasis on the first episode of schizophrenia.

SPSI24: Translating Quantitative Imaging from Academia to the Practice of Precision Medicine
Room E351
Learn the role of the Quantitative Imaging Biomarkers Alliance (QIBA®) in facilitating the practice of precision medicine and understand the QIBA process and deliverables.

SPSI25: Quality, Clinical Care and Effectiveness in Image-Guided Therapy: Do It Right, First Time, Every Time
Room S404AB
Presenters will discuss how interventional radiologists in multidisciplinary cancer care teams and as key players in the decision-making process. Quality assurance measures and the importance of patient-reported outcomes will also be discussed.

SPSI26: How Radiologists Can Improve Mammography Screening in the U.S.—Get Organized
Room S402AB
Presenters will discuss how improved systems and partnerships with referring physicians can lead to better adherence with regular breast screening. Processes to ensure accurate breast cancer risk assessment for all patients will also be covered.

SPSI27: Preparing Radiologists to Jump into the “Shark Tank”
Room N228
Learn about venture capitalist funding as an alternative to traditional research funding options. Participating researchers will take part in an interactive session modeled after the popular television show “Shark Tank.” Tips for creating a proposal and protecting intellectual property will be covered. Look for full coverage of this session in Wednesday’s Daily Bulletin.

SPSI28: Special Interest Session: High Impact Clinical Trials
Room S404CD
Three late-breaking clinical trials, selected for their significant contributions to radiology research, will be discussed:

• Impact of Repeat Injections on Outcomes Following Epidural Injection of either Corticosteroid and Lidocaine Versus Lidocaine Alone

• Myometric Data Derived from Routine CT Examinations Predict Adverse Post-Exubation Outcomes in Critically Ill Patients

• A Randomized Trial Comparing Coronary Computed Tomography Angiography and Stress Echocardiography in Low-to-Intermediate Risk Emergency Department Patients with Chest Pain
SHARE YOUR KNOWLEDGE AND BE SEEN

Present at RSNA 2017:
- Scientific Presentations
- Applied Science
- Education Exhibits
- Quality Storyboards
- Quantitative Imaging Reading Room

EARN RECOGNITION!

The RSNA Travel Award Program for Students
Up to 430 top-rated abstracts from current RSNA members will earn a $500 travel stipend.

Kuo York Chynn Neuroradiology Research Award
The top scientific paper as selected by the Scientific Program Committee will earn a $3,000 award recognition.

Visit RSNA.org/Abstracts for complete guidelines.

Submit online
beginning January 2017 at RSNA.org/Abstracts
through Wednesday, April 12, 2017, NOON Chicago Time.

Questions?
Call 1-877-776-2227 (within U.S.)
or 1-630-590-7774 (outside U.S.)

Includes courses in joint sponsorship with the American Association of Physicists in Medicine

RSNA® 2017
NOVEMBER 26 – DECEMBER 1
R&E Foundation Announces Record Grant Funding in 2016

By Mary Henderson

On Sunday afternoon in the Arie Crown Theater, Burton P. Drayer, MD, and Fergus V. Coakley, MD, announced the record $7.1 million in grant funding for 2016 by the Foundation’s Research & Education (R&E) Foundation, highlighting the innovative work of funded researchers and the need for continued support of the Foundation’s efforts to move the specialty of radiology beyond imaging.

“Year after year, R&E grant recipients pursue projects that go beyond radiologic sciences and touch every area of healthcare,” Dr. Drayer said, “For us all, it is critical that as an entire community, we pursue projects that go beyond radiologic sciences and touch every area of healthcare, into every area of medicine and most importantly, patient care.”

Dr. Drayer reported that Inspire – Innovate – Invest: The Campaign for Funding Radiology’s Future is moving steadily toward the goal of $7.1 million. Launched in 2014, the Campaign will help radiologists secure and maintain a leadership position in the community of innovation.

In 2016, the Campaign for Funding Radiology’s Future will support 26 practice groups who have generously committed $800,000 to fund the RSNA/Strategic Radiology Research Seed Grant,” he added.

Dr. Drayer also thanked all of the dedicated corporate donors and Vanguard companies, for their steadfast support of the R&E mission. Finally, he challenged the audience to join the Campaign to ensure that research in radiologic sciences continues to be conducted by radiologists.

“The need for your support is great,” he said. “As NIH funding dwindles and competition for funding from other private and public sources becomes increasingly more difficult, you can fill this gap by supporting our Foundation, and you can be assured that your donation will be used directly to fund radiology research and education.”

Structured Reporting Among Methods for Improving Communication

By Felicia Dechter

COMMUNICATION is vital among all members of a multidisciplinary team working to develop individual treatment plans for cancer patients, according to presenters at a Sunday session.

For example, it’s critical that content in radiology reports be communicated clearly to other physicians, said Herbert Alberto Vargas, MD, a Department of Radiology head who noted the value of radiology reports found that 20 percent of responding clinicians said the language and style used in radiology reports was unclear, said Dr. Vargas, director of genitourinary radiology at the Memorial Sloan Kettering Cancer Center in New York. Another study determined that referring clinicians may reach different conclusions when reading the same reports, he said.

To that end, structured reporting, which allows for effective communication of imaging findings by standardizing format, terminology and content, is an effective solution, said Dr. Vargas.

“We need uniform ways to communicate radiologic findings, clinical impressions and management recommendations,” he said.

Another important issue relevant to standardized reporting is the expression of diagnostic certainty, Dr. Vargas said.

“Radiologists are often tasked with summarizing multiple findings and rendering an opinion with regard to potential explanations for the radiographic findings,” Dr. Vargas said. “There are scenarios in which no differential diagnoses are warranted and the findings are reported in terms of the absolute presence or absence of a pathologic process, for example, ‘no fracture.’”

In other cases, findings are not definitive, and radiologists need to indicate their level of certainty for their interpretation of the imaging findings, Dr. Vargas said. In a study of patients with prostate cancer, 38 different terms were used in MRI reports to express the levels of certainty for the presence of extracapsular extension (ECE), prior to the introduction of a five-point “certainty lexicon,” he said.

“The lexicon not only simplified the communication of the radiologists’ level of suspicion but also allowed for more objective quantification of the diagnostic performance of MRI for diagnosing ECE,” Dr. Vargas said.

“However, the benefits of structured reporting cannot be accepted dogmatically,” Dr. Vargas said. “An accurate interpretation reported in ‘free-form’ style is more clinically useful than a structured report containing erroneous information.”

Subspecialty Opinions Demonstrate Benefits to Cancer Patients

While Dr. Vargas discussed how radiologists report using standardized, structured reports, presenter Fergus Coakley, MD, professor and chairman of Diagnostic Radiology at the Oregon Health and Science University in Portland, spoke about who is reporting and the importance of that person being a subspecialist.

Communication is critical in subspecialty opinions given after an initial radiology reading — which is often critical to a patient’s care,” Dr. Coakley said.

In an analysis of published data on the value of subspecialist reads in journals including Radiology and the Journal of Otolaryngology — Head & Neck Surgery, Dr. Coakley determined that subspecialist opinions often alter the initial reading of radiologic studies in cancer patients.

“Telling you the bottom line is, if you get a subspecialist opinion, 10 to 20 percent of the time it will result in actionable change,” Dr. Coakley said.

And usually — roughly 80 to 90 percent of the time — that change is for the better.”

Dr. Coakley cited cases where diagnoses were changed after readings by a subspecialist. In one case, a 51-year-old man diagnosed with pancreatic cancer was referred for the Whipple procedure. But a subsequent read by a subspecialist indicated the patient did not have pancreatic cancer — he had autoimmune pancreatitis that was successfully treated with medication and not surgery, Dr. Coakley said. “He needed steroids rather than a pointless operation,” Dr. Coakley said.

In another case, a patient diagnosed with pancreatic cancer underwent four rounds of chemotherapy before a subspecialist reinterpreted the images. “There was no cancer, there had never been a cancer,” Dr. Coakley said.

In light of his analysis, Dr. Coakley said that offering formal second opinions for cancer imaging studies is a service that academic radiology departments may want to consider.

“Year after year, R&E grant recipients pursue projects that go beyond radiologic sciences and touch every area of healthcare into every area of medicine and most importantly, patient care.”

“The need for your support is great,” he said. “As NIH funding dwindles and competition for funding from other private and public sources becomes increasingly more difficult, you can fill this gap by supporting our Foundation, and you can be assured that your donation will be used directly to fund radiology research and education.”

http://www.rsna.org/research/
High Intensity Focused Ultrasound Helps Control Pain in Cancer Patients

By Richard Dargan and Paul LaTour

MR-guided high intensity focused ultrasound (MRgFUS) is a safe and effective method for managing cancer pain by reducing their dependence on opioid medications, according to research presented Sunday by Alessandro Napoli, MD.

Pain affects up to 80 percent of cancer patients and has a strong negative impact on quality of life and survival. Opioid pain medications are often prescribed for pain relief, especially in patients with advanced disease, but they have risks, including dependency. Other options like chemotherapy, radiation therapy and ablation carry their own set of risks and side effects.

Dr. Napoli said MRgFUS offers many benefits over other options.

“This is a completely non-invasive therapy with no risk for bleeding or infection,” said Dr. Napoli, a researcher in the Radiology, Oncology and Interventional Imaging department at Sapienza University in Rome, Italy. “In addition, it’s a highly precise technology, thanks to MRI real-time visualization and guidance that increases both the safety and the efficacy profile. Plus it is radiation free so there are no toxicity-related effects.”

MRgFUS has emerged in recent years as an innovative and noninvasive alternative pain treatment for cancer patients. In the procedure, a transducer focuses ultrasound beams to induce an increase in temperature in the targeted area, destroying the tissue.

Real-time monitoring with ultrasound or MRI increases the procedure’s safety and efficacy.

MRgFUS has been studied to relieve pain in pancreatic, bone metastases and recurrent cervical carcinoma. Dr. Napoli’s group reported promising results in the management of patients with pancreatic cancer, a condition in which pain is notoriously difficult to control.

“The population of patients often has a poor prognosis and low life expectancy,” said Susan Dababou, the study’s lead author and a medical student at Sapienza. “The cancer-specific therapy is often very debilitating and pain can be a worsening factor of the general condition of these patients.”

Studies showed that almost 80 percent of pancreatic cancer patients reported pain relief after focused ultrasound treatment. In one case described by Dr. Napoli, a 74-year-old female with stage III pancreatic cancer experienced significant pain reduction after MRgFUS ablation of a mass in her abdomen. Post-procedural MRI showed that important vascular structures near the treatment area were undamaged.

The patient was able to stop daily consumption of opioid medications only two days after the procedure.

Promising results for MRgFUS have also been seen in patients who experienced cancer spread to their bones. An international multicenter study that included the Sapienza University researchers found pain palliation in more than 70 percent of patients with bone metastases. The technique has also shown promise in patients with recurrent cervical cancer, although more research is needed.

The duration of pain palliation, which is linked to the size of ablation of the tumor mass, can be substantial in the absence of disease recurrence, according to Dababou.

“The patients with pancreatic cancer treated with focalized ultrasound energy by our group were followed for six months and the pain relief lasted for the whole period,” she said. “There is evidence of at least nine months of pain relief in bone metastases treated with MRgFUS.”

Recent studies have shown that high-intensity focused ultrasound also has promising effects when coupled with chemotherapy and radiation therapy, improving patients’ responses to anti-cancer therapy.

“In comparison with pharmacological treatment, MRgFUS acts on different fronts, ensuring an adequate pain relief, boosting the effect of chemotherapy and radiotherapy, and easing recovery,” Dababou said. “The compliance of the patients is favored by the non-invasiveness and non-toxicity of the procedure, and unlike pharmacological therapy, it is a single session treatment with mild or no complications.”

Presently, the main limitations of MRgFUS are cost and that not all parts of the body are accessible.

Radiology Should Take the Lead in Improving Cybersecurity

By Richard Dargan

Because medical imaging devices are increasingly vulnerable to attacks from hackers, radiologists should take a leadership role in ensuring that facilities and institutions are doing as much as possible to counter the threat, according to presenters at a Sunday session.

Threats to medical device security can come from many factors, said Kevin Hemsley, project manager for the Idaho National Laboratory supporting the Department of Homeland Security’s Industrial Control Systems Computer Emergency Response Team. Ideologically motivated “hacktivists” can break into systems in order to make a statement, while criminal elements sell medical data at a premium on the black market. Ransomware attacks, in which hackers take control of a system and demand money, have become increasingly common.

Imaging systems are not invulnerable, Hemsley said. Recently, a company hired to look for vulnerabilities in a hospital’s MRI system discovered that the host system’s firewall and automatic updates were off and there were 114 open ports.

“The company found out they could get into the imaging processor and controller and they did all of this from the guest WiFi system,” Hemsley said.

Radiologists need to be more proactive in taking steps to mitigate threats, said J. Anthony Seibert, PhD, professor and associate chair of informatics at the University of California Davis Health System in Sacramento.

“We need to overcome our denial,” Dr. Seibert said. “Security is an imaging system problem. Even in a secure subnet you can be extremely vulnerable.”

Vulnerabilities on devices include hardcoded passwords and no encryption of patient data. A recent study determined that many facilities fail to change the generic usernames and passwords that are supplied with equipment software. The study found that among the most common passwords were “operator,” “scan” and “service.”

The biggest threats to an organization come from within the form of disgruntled employees. Administrators should turn off accessibility as soon as employees are dismissed, he said.

“The fact is, security is a shared responsibility,” Dr. Seibert said. “It’s not just vendors but also users who have ultimate responsibility.

Fighting Back Against Hackers

Radiologists and managers can fight back against hackers in a number of ways, including educating staff on cybersecurity risks. On the technical side, firewalls, virtual private networks and encryption are essential tools. Physical measures include device isolation, access restriction and methods to back up data. Administrators should be sure to document security policies, maintain audit trails and enforce policies.

“We need to continue to work on this until we have 100 percent compliance,” Dr. Seibert said.

He also recommends using a two-factor authentication process, encrypted USB drives and biometric identification for access to imaging systems. Devices should not be directly accessible to the Internet, Hemsley said. Users can use Shodan.io, a search engine for Internet-connected devices, to search their IP space to see what devices others can see over the Internet. Hemsley showed results of such searches including imaging reports, prescriptions and other private information.

The best security systems are seamless to users, Dr. Seibert noted. Seamlessness will be achieved in the future through technological advances such as biometric scans to replace passwords and near-field communication devices which require physical proximity to operate a device.

“Security risk management is an ongoing process,” he said. “You have to be proactive and maintain patient safety as an overriding objective.

“Cybersecurity is more than HIPAA,” Hemsley added. “It equals patient safety.”
RSNA 2016 Sessions Go Beyond Imaging to Move Radiology Forward

In this new area of radiology and healthcare, radiologists are being asked to go beyond imaging to gain a broader perspective on every facet of the patient experience.

Radiologists must actively collaborate with referring physicians, stay abreast of advancing subspecialty knowledge, be part of the digital revolution and stay at the forefront of clinical imaging research, said 2016 RSNA President Richard L. Baron, MD, in the President’s Address Sunday at the Arie Crown Theater.

“Now more than ever the radiology community needs to reflect on our culture and practices and seek new clinical and research approaches. It is time we look beyond imaging to see new ways to move the specialty forward,” Dr. Baron said.

This year’s RSNA Meeting Program offers a vast array of sessions designed to empower attendees seeking to embrace the future of radiology from every angle. Below is a sampling.

RCC25 (Educational Course)
How to Create a Culture of Continuous Quality Improvement Using Existing and Free Resources
Monday 4:30-6:00 PM
Room: S501ABC

LEARN HOW TO EMPOWER lead performance, interpretation and system improvements and create a culture of continuous quality improvement using existing or available free resources.

SPS122 (Special Interest Session)
Special Interest Session: A New Model of Patient Care: Value over Volume-a RAD Talk
Monday 4:30-6:00 PM
Room: E353B

A LONG WITH DISCUSSING RSNA’S Radiology Cares: The Art of Patient-centered Practice and ACR’s Imaging 3.0 campaigns, presenters will discuss how to assess the radiology practice model and realign it to focus on value over volume as well as tactics to put the concepts of patient-centeredness and value vs. volume into practice.

RC217 (Educational Course)
Emerging Technology: PET/MRI – Opportunities and Challenges
Tuesday 8:30-10:00 AM
Room: S504CD

SUBSESSIONS INCLUDE PET/MRI: The Evolving Field of Structure and Function and PET/MRI Physics: The Opportunities and Challenges.

RC354 (Educational Course)
Preparing Your Radiology Practice and IT Department for Big Data
Tuesday 8:30-10:00 AM
Room: S404AB

THE SESSION FOCUSES on big data approaches to radiology and the importance of developing a comprehensive IT architecture and capability beyond the EMR in order to effectively use big data tools.

RC307 (Educational Course)
Predicting Outcomes for Genitourinary Malignancies: Role of Radiomics in Clinical Practice
Tuesday 8:30-10:00 AM | Room: S405AB

PRESENTERS REVIEW the histopathologic and genetic heterogeneity of bladder cancer and how these differences translate importantly to clinical practice. Attendees will learn how tumor features assessed using MR techniques such as DWI and DCE imaging, correlate with clinical and pathogenetic features of bladder cancers such as tumor aggressiveness, stage, histopathologic phenotype, immunohistochemical biomarkers response to chemotherapy and disease specific survival.

SSG07-06 (Educational Course)
Radiology Report Terminology: Interpretive Differences between Patients and Radiologists
Tuesday 11:20-11:30 AM
Room: S402AB

P RESENTERS DISCUSS research demonstrating that patients’ perceptions of terminology within the radiology report are not synonymous with those of radiologists and that these differences could lead to confusion and dissatisfaction.

MSTR714 (Educational Course)
ASRT@RSNA 2016: A Team Approach to Patient-centered Imaging
Wednesday 8:00-9:00 AM
Room: N230B

T HIS SESSION FOCUSES on the demonstrated value of establishing a multidisciplinary team to enhance patient satisfaction in imaging.

RC527 (Educational Course)
Academic and Community Practice Integration: Challenges and Strategies for Success
Wednesday 8:30-10:00 AM
Room: S104A

T HERE IS increasingly blurring distinction between academic and community radiology practices. Presenters discuss the challenges of running successful hybrid academic-community practice and highlight the unique advantages of academic subspecialty radiology groups in providing quality service for the community.

HP230-SD-WEAS (Educational Course)
Teaching Radiologists Who Perform Image Guided Interventions Effective Communication Skills through Simulation
Wednesday 12:15-12:45 PM
HP Community, Learning Center
Station #5

P RESENTERS THAT DISCUSS workshops that teach radiologists’ effective communication skills may increase radiologists’ comfort communicating with patients during image guided procedures.

SSM02-03 (Educational Course)
Impact of Second-Opinion Review of Breast Imaging at a Cancer Center: Is It Worthwhile?
Wednesday 3:20-3:30 PM
Room: E451B

RSNA Student Travel Stipend Award

P RESIDENTS DISCUSS research showing that second-opinion review of outside breast imaging has a significant impact on surgical management and is a worthwhile utilization of resources and valuable for patient care.

RC627 (Educational Course)
Radiology in a New Payment Model Environment
Thursday 8:30-10:00 AM
Room: S404AB

P RESIDENTS WILL DISCUSS the “current state” of Radiology but will also focus on future reimbursement trends that will define our subspecialty for the next 10 years.

SSQ10-01 (Educational Course)
Informatics Keynote Speaker: Using Imaging Informatics to Improve Quality and Safety in the Era of Value-Based Care
Thursday 10:30-10:40 AM
Room: S403A

RC732C (Educational Course)
Mentoring in the Culture of Multigenerational Workforce and Diversity
Thursday 4:30-6:00 PM | RC732C
Room: S502AB

UNDERSTAND HOW mentor-mentee relationship and expectations are changing in the current environment of multigenerational workforce and diversity. Learn what leadership skills are needed to become good mentors. Understand what to do and what not to do when you are looking for a mentor.

MK258-ED-X (Educational Exhibit)
Musculoskeletal System Imaging-Guided Percutaneous Biopsies: Update and Systematic Comprehensive Review
All Day

VI Community, Learning Center

P RESENTERS DISCUSS the multidisciplinary approach to musculoskeletal system imaging-guided percutaneous biopsies, whereby the radiologist works closely with the clinicians/pathologist to maximize the possibility of definitive diagnosis while minimizing potential complications.

NR22-1-ED-X (Educational Exhibit)
Looking through the Surgical Lens: A Radiologist’s Guide to Understanding Surgical Landmarks and Advances in Head and Cancer Therapy
All Day

NR Community, Learning Center

T HIS EXHIBIT covers important surgical landmarks that are crucial for planning head and neck cancer surgery so that these can be incorporated into radiology reports. Advances in oncologic surgery including robotics and the role imaging plays in determining surgical options are included.
Learning Center Exhibits

Monday – Friday, 8 a.m.-5 p.m.
AI and Machine Learning in Radiology
Demonstration: The Eyes of Watson
With advances in machine learning and artificial intelligence, a new role is emerging for machines as intelligent assistants to radiologists in their clinical workflows. Computers can pre-analyze large amounts of imaging and text in electronic health records using deep learning to identify patterns and perform clinical inference using a priori clinical knowledge to assemble relevant information for diagnosis by radiologists.

But what systematic clinical thought processes are these machines using? Are they similar enough to those of radiologists to be trusted as assistants? At the Eyes of Watson demonstration, participants can select a case from various subspecialties, attempt to make a diagnosis, and then see Watson’s process for the same case. Attendees can watch the inner workings of Watson as it attempts the case and then help evaluate its approach. Learn how machines can assist radiologists, reducing the time to diagnose and increasing efficiency in workflows.

Deep Learning: What the Radiologist Needs to Know
Deep learning (DL) is rooted in machine learning and artificial neural networks, concepts which focus on teaching computers to learn to solve problems. This session will focus on the application of DL to radiology and its potential to add significant value to the radiologist’s interpretation of complex images.

Mind in the Machine: A Radiology Primer on Machine Learning
Presenters will define machine learning (ML), review applications of ML, offer an overview of fundamental steps in constructing ML algorithms and discuss future directions.

Artificial Neural Networks: A Machine Learning Algorithm for Image Analysis in Radiology
Presenters will discuss neural networks — machine learning (ML) algorithms that use computational architectures inspired by the organization of the mammalian visual cortex — and give an overview of an artificial neural network (single-layer vs. convolutional neural networks).

Deep Learning with Convolutional Neural Networks for Radiologic Image Classification
The presenter will review recent research developments in deep learning, particularly with respect to convolutional neural networks applied to medical image analysis.

Tuesday, Nov. 29
Deep Learning: An Example of Big Data Applications
This session provides a technical overview of machine learning (ML) and deep learning (DL), illustrate applications of ML and DL in radiology, and examines challenges in deploying ML and DL in radiologist workflow and productivity demands.

Wednesday, Nov. 30
Improving Reading of T2 MRls through Deep Learning
Presenters discuss a possible direction for automating the process of finding new relevant imaging biomarkers for disease using a relatively uncommon disease in a heterogeneous patient group. Researchers trained a neural network to identify both the standard TNM staging as well as the 12-month outcome variable.

Ensemble Deep Learning for the Improvement of the Performance of Computer-aided Detection of Polyps in CT Colonography
Presenters discuss research evaluating an ensemble deep learning (EDL) in the improvement of the detection performance of computer-aided detection (CADe) of polyps in CT colonography.

Thursday, Dec. 1
Hot Topic Session: The Promise of Machine Learning (and Pattern Recognition) in Radiology
Quantitative Radiomics, Big Data, and Deep Learning in Precision Medicine
The presenter will discuss advances in a computer power and machine learning algorithms that are allowing for computer-extracted features, both from clinically-driven computer-extraction systems (such as those from computer-aided diagnosis) and deep learning methods, to yield “radiomics” — the high throughput conversion of image sets into a multi-dimensional feature space.

RSNA 2016 Sessions Explore the Potential of Machine Learning

The result, he said, is a decentralized team and less collegial work environment. “Dr. Baron and Johns Hopkins have all moved radiology reading rooms closer to the consulting clinicians, and the results have been impressive. While praising the rapid pace of innovation radiology has set, Dr. Baron reminded the audience continued meaningful research is critical to continued growth.

“Innovation will drive the future, and the future belongs to those who lead impactful research,” he said.

That means radiology research that reaches beyond the radiology journals and community to contribute to the general medical and science community. Radiology has not been adept at this, according to Dr. Baron, and “(w)e need to dramatically increase our research focus in this area.”

Finally, Dr. Baron turned the focus to patients. “All of these changes create ripples in the pool of healthcare delivery, but the furthest reaching impact is that on our patients,” Dr. Baron said, emphasizing that all of this should be considered through the lens of an improved patient experience.

“The radiology community should make virtually all practice decisions with a focus on what is optimal for the patient rather than focusing on what is convenient, more efficient, or more lucrative,” he said.

That starts with the radiology report, according to Dr. Baron. He noted resources such as the RSNA report template library that provide a framework for organizing the findings and ensuring a complete evaluation. And that reorganization around subspecialty practices will enable radiologists to keep up with the “explosion of medical knowledge” and provide optimal answers.

“Every report should be approached and delivered exactly as you and I would want for our family members,” he said.

Studies have shown, he said, that when radiologists keep the patient in mind—keeping a photo nearby, for example—their accuracy improves.

Reminding the audience of that pebble creating ripples in the pond, Dr. Baron said, “With these changes in place, we will position ourselves and the specialty of radiology as valued resources and indispensable partners in patient care.”
System Inefficiencies Lead to Duplicate CT Studies

By Mike Bassett

A nalyzed repeated CT scans and categorized them according to the reasons for duplication, including inadequate CT image data transfer, poor image quality, repetition of head CT after head injury together with completion to whole-body CT (WBCT), and follow-up of known injury from previous CT.

They also calculated the cumulative radiation dose and costs associated with potentially preventable duplicative CT exams, which they defined as scans that were repeated because of inadequate image data transfer or poor image quality.

In this study 68 out of 298 patients whose conditions were not manageable in the referring hospital were transferred to the trauma center because of either severe head injury (n=45) or major body trauma (n=23). Seventeen other patients were transferred because they were being repatriated from a foreign country (n=14) or because there was no ICU capacity (n=3).

Of these 85 transferred patients, 74 (87.1 percent) had repeated CT scans. The reasons included:

- Inadequate CT image data transfer (n=29; 39.2 percent)
- Repetition of head CT with completion to WBCT (n=24; 32.4 percent)
- Follow-up of known injury (n=21; 28.4 percent)

None of the repeated CT studies were performed because of poor image quality.

Dr. Hinzpeter and her colleagues determined that the cumulative dose-length product of all of the repeated CT scans was 1,383 mSv or 18.7 mSv per patient, while patients who underwent potentially preventable repeat CT scans (those due to inadequate CT data transfer) received an overall additional effective radiation dose of 631 mSv, or 21.8 mSv per patient.

The additional costs associated with all of the repeated CT exams was $70,433, while the additional costs of potentially preventable CT exams was $38,961.

“Additional number of transferred trauma patients undergo potentially preventable repeated CTs, adding radiation dose to the patients, and costs to the healthcare system,” Dr. Hinzpeter concluded, adding that the main culprit was inadequate CT image data transfer.

“Future efforts should be made for improving and accelerating image data transfer, allowing for timely and complete availability of CT image data, even in the setting of acute trauma,” she said.

Hatem Alkadhi, MD, of the University Hospital Zurich, who co-authored the study, pointed out that CT image data transfer of trauma patients to his hospital is performed either by manual transfer of CDs or via the internet. The problem is that in the case of acute trauma radiologists and clinicians want CT images made available as quickly as possible, even though the use of CDs is known to be inad- equate computer and software systems.
Non-Invasive Techniques May Improve Outcomes for More Heart Patients

By Mike Bassett

TRANSCATHETER AORTIC valve replacement (TAVR) continues to see dramatic growth in Europe and North America, and multidetector computed tomography (MDCT) is playing an increasingly important role in improving the clinical outcomes of patients undergoing the procedure, according to presenters at a Sunday session.

While open aortic valve replacement continues to be the gold standard for treating patients with severe aortic stenosis, “the rapid evolution of balloon-expandable TAVR — both procedural developments and technical enhancements — indicates it is at least as good, if not better, than the best surgical outcomes in comparable patient groups,” said Dominik Fleischmann, MD, a professor of radiology at the Stanford University Medical Center, and session moderator.

And while TAVR has traditionally been a treatment for severe symptomatic aortic stenosis for patients who are at high risk of mortality or complications from traditional open-heart surgery, Dr. Fleischmann pointed out that studies have been carried out demonstrating the value of TAVR for intermediate risk patients.

“And we can predict that even lower-risk patients will be doing TAVR very soon,” he said. “The salient point is that if you ask patients, they really want TAVR.”

With that in mind, said Jonathon Leipsic, MD, vice chairman of radiology and associate professor of radiology and cardiology at the University of British Columbia, it is apparent that “TAVR is really pushing the boundaries.”

Dr. Leipsic described how the use of MDCT has helped improve the clinical outcomes of patients undergoing TAVR.

“While cardiac CT initially played a secondary role in screening patients prior to TAVR, for the last seven or eight years it has really advanced the field through the integration and validation of cardiac CT,” Dr. Leipsic said. “Now, it plays an essential role in the pre-procedural planning and guidance of TAVR.”

According to Dr. Leipsic, cardiac CT is now the first-line test for device sizing, and the non-invasive gold standard for the discrimination of risk of annular rupture or coronary occlusion.

“All of this has happened through active research by the CT community, looking first at which measures of CT are reproducible, how to obtain them, and then looking at how to integrate into pre-procedural planning,” said Dr. Leipsic.

Dr. Leipsic outlined a number of reasons why pre-procedural MDCT is essential for TAVR, such as preventing vascular injury, obtaining more precise pre-procedural measurements, and preventing annular injury.

“The original reason why we used CT is vascular injury,” Dr. Leipsic said.

Dominik Fleischmann, M.D.
Jonathon Leipsic, M.D.

Transcatheter aortic valve replacement continues to see dramatic growth in Europe and North America, and multidetector computed tomography (MDCT) is playing an increasingly important role in improving the clinical outcomes of patients undergoing the procedure, according to presenters at a Sunday session.

While open aortic valve replacement continues to be the gold standard for treating patients with severe aortic stenosis, “the rapid evolution of balloon-expandable TAVR — both procedural developments and technical enhancements — indicates it is at least as good, if not better, than the best surgical outcomes in comparable patient groups,” said Dominik Fleischmann, MD, a professor of radiology at the Stanford University Medical Center, and session moderator.

And while TAVR has traditionally been a treatment for severe symptomatic aortic stenosis for patients who are at high risk of mortality or complications from traditional open-heart surgery, Dr. Fleischmann pointed out that studies have been carried out demonstrating the value of TAVR for intermediate risk patients.

“And we can predict that even lower-risk patients will be doing TAVR very soon,” he said. “The salient point is that if you ask patients, they really want TAVR.”

With that in mind, said Jonathon Leipsic, MD, vice chairman of radiology and associate professor of radiology and cardiology at the University of British Columbia, it is apparent that “TAVR is really pushing the boundaries.”

Dr. Leipsic described how the use of MDCT has helped improve the clinical outcomes of patients undergoing TAVR.

“While cardiac CT initially played a secondary role in screening patients prior to TAVR, for the last seven or eight years it has really advanced the field through the integration and validation of cardiac CT,” Dr. Leipsic said. “Now, it plays an essential role in the pre-procedural planning and guidance of TAVR.”

According to Dr. Leipsic, cardiac CT is now the first-line test for device sizing, and the non-invasive gold standard for the discrimination of risk of annular rupture or coronary occlusion.

“All of this has happened through active research by the CT community, looking first at which measures of CT are reproducible, how to obtain them, and then looking at how to integrate into pre-procedural planning,” said Dr. Leipsic.

Dr. Leipsic outlined a number of reasons why pre-procedural MDCT is essential for TAVR, such as preventing vascular injury, obtaining more precise pre-procedural measurements, and preventing annular injury.

“The original reason why we used CT is vascular injury,” Dr. Leipsic said.
Non-invasive Techniques May Improve Outcomes for More Heart Patients

pointing out that patients who experience vascular injury are at an increased risk not only of morbidity, but of mortality. Research has shown that the use of CT helps prevent this, he said.

When it comes to the use of MDCT for annular sizing and valve selection, “we in the CT community take a lot of pride in improving sizing,” said Dr. Leipsic. “In the early days of TAVR people were using 2-D [echocardiography] and you can imagine that the annulus is almost a uniformly non-circular structure. So how are you going to give a two-dimensional measurement of a 20 by 28 millimeter structure?”

“This is where CT has really asserted itself as the primary tool for sizing,” he said. Dr. Leipsic referred to the results of a multi-center study he participated in that showed that CT integra-

Downloaded from https://www.rsna.org/ on 12/13/2016 4:54:33 PM.
The Distinction You Deserve...  
**The Benefits You Want.**

Convey your commitment to the radiology specialty and support excellence in patient care when you join the specialty’s most influential professional organization.

**RSNA Members Enjoy:**
- Free advance registration to the **RSNA annual meeting**
- Free subscriptions to *Radiology* and *RadioGraphics*
- **eLearn** online education resources
- **Grant opportunities** that launch careers
- **Community** for networking, advocacy and innovation

Demonstrate your commitment to radiology education, professionalism and community.

---

**Join Today!**

Learn more at [RSNA.org/Membership](http://RSNA.org/Membership)

---

1-877-RSNA-MEM (776-2636)  
1-630-571-7873 (outside the U.S. or Canada)
Open-source Software May Help Reduce the Cost of 3-D Printing

Three-D printing takes 3-D visualization to another level by transforming digital images from CT and MRI scans into physical models that clinicians can hold in their hands.

By Elizabeth Gardner

BUT MAKING SURE THE 3-D “print-out” is a perfect representation often has challenges, according to presenter of a Sunday session.

Vendors of commercial 3-D printers for medical applications also sell FDA-approved software that has been rigorously tested to make sure the printer renders the information from the images accurately. But it typically costs thousands of dollars to license that software, so despite the sharp drop in price for the printers themselves, the models can still be costly.

“Medical 3-D printing can get very expensive very quickly,” said James Shin, MD, a biodesign and informatics fellow in Medicine College in New York.

Although free open-source software can greatly reduce the cost of making a medical model, it has to be validated against commercial software. “It’s not sexy research, but if we’re not sure the software is accurate, it’s not going to contribute the way it should,” Dr. Shin said.

Dr. Shin presented research that compared Mimics, a commercial software package from the Belgian company Materialise, with 3-D Slicer, a free software program created under multiple grants by a consortium of researchers and programmers. (The 3-D slicer is also being demonstrated this week in the Quantitative Imaging Reading Room, Lakeside Center.)

The research compared a model of facial bones with a model of a cardiac lumen. The facial bone model was based on a single non-contrast 64-slice CT scan of the face, while the cardiac lumen model was based on a single 320-slice contrast-enhanced cardiac CT scan.

The study found that for facial bones and the cardiac lumen, the two programs created physical 3-D models of comparable accuracy and quality. The cardiac models were virtually identical, Dr. Shin said, and the model of facial bones showed only minor discrepancies.

Both types of software interpret DICOM images and do a certain amount of “guesswork” to fill in gaps in the data, but with the density and detail available from most imaging studies today, gaps are minimal. Moreover, commercial software packages often use the same algorithms available in open-source software.

One potential danger in image processing is choosing to “oversmooth” the images — removing artifacts while accidentally taking away some of the small detail that makes a 3-D model accurate and useful.

“At some point you hit the sweet spot where the image is smooth but still accurate,” Dr. Shin said.

But it’s possible to take the process too far, he added.

Because there is not yet a formal recognized training for using images to print 3-D medical models, this decision may fall to a radiologist, an engineer, or even a graphic designer, depending on the process used to create the model.

“If you don’t have a grasp of it as an integrated vertical process, you leave yourself open to errors,” Dr. Shin said.

Annual Oration in Diagnostic Radiology Presented Today

Healthcare Transformation: Driving Value Through Imaging

IN THE EVOLUTION from fee-for-service healthcare to value-driven population health, healthcare systems must learn to embrace patient-centered, value-focused practices, and the leaders of these systems must be committed to building these cultures, according to Vivian S. Lee, MD, PhD, MBA, who will present today’s Annual Oration in Diagnostic Radiology, “Healthcare Transformation: Driving Value through Imaging.”

As a centralized core of experts informing care pathways and practices, radiology must play a key role in both understanding and defining value for providers and their patients, said Dr. Lee, a professor of radiology, senior vice president for health sciences, dean of the school of medicine and CEO of University of Utah Health Care.

At the University of Utah and elsewhere, engaged radiologists are tapping into their health systems’ culture of value to evolve the way providers engage with imaging specialists to improve patient expectations, and create real and measurable cost efficiencies. The transformation of healthcare requires engaged radiologists to produce more cost effective, quality outcomes.

Dr. Lee serves on the Council of the National Institutes of Health and the Administrative Board of the Council of Deans for the Association of American Medical Colleges. Dr. Lee is a past president of the International Society for Magnetic Resonance in Medicine.

Dr. Lee served on the RSNA Refresher Course Committee as cardiac chair and cardiovascular chair. She received the Radiology Editor’s Recognition Award for reviewing with distinction in 2003, 2005 and 2007.

• 1:30 p.m., Arie Crown Theatre

Correction:

We regret that an incorrect image appeared on page 6B of the Sunday Technical Exhibits Focus. The correct image is to the right.

Samsung Electronics, BOOTH 4735 | Mobile Digital Radiography System

Samsung Electronics’ newly launched GM85, a premium mobile digital radiography system, provides advanced mobility, maximized user convenience and a high image quality. Its ultra-compact design allows easy access around tight spaces and the adaptive soft driving control, front bumper sensor and collapsible column offer safe navigation and an ultimate driving experience. The system also features a multi-touch screen panel, image display screen on the tube head unit (THU), and extensive long tube reach for easier operation.
Resident Performance Benefits from 24/7 Attending Coverage

Radiology residency programs that have shifted to a learning model that includes 24/7 in-house radiology attending coverage are seeing positive results in terms of resident performance, efficiency and patient care, new research shows.

By Felicia DeCher

“AS WITH ALL ACADEMIC MEDICAL CENTERS, our radiology residency program has experienced the transition towards more direct supervision with an on-site radiology attending presence,” said Siavash Behbahani, MD, MS, a third-year radiology resident at Winthrop University Hospital in Mineola, N.Y., during a Sunday session. “While multiple economic and legal forces have fueled this movement, it challenges traditional learning models for radiology residents.”

In assessing the impact of 24/7 in-house radiology attending coverage on radiology resident performance at Winthrop, Dr. Behbahani and principal project investigator, A. Orlando Ortiz, MD, MBA, chairman of the Radiology Residency Program at Winthrop, retrospectively reviewed radiology resident reports on emergent diagnostic radiology procedures conducted between November 2015 and March 2016. In all, 29,636 studies were preliminarily interpreted by 17 radiology residents on call under 24/7 supervision by an in-house radiology attending who was available for questions during the shift. The analysis demonstrated that the resident-faculty rate of missed findings for radiographs was 0.8 percent compared to a higher rate reported in the literature of 1.4 percent without 24/7 direct attending supervision, Dr. Behbahani said. Results also demonstrated a decrease in the rate of resident-faculty discrepancy for cross-sectional studies (CT — 0.5 percent vs. 2.4 percent, ultrasound — 0.1 percent vs. 0.6 percent, and MR — 1.1 percent vs. 3.7 percent).

As the year of resident training increased, missed findings decreased, he said. “We also observed that the rates of minor and major discrepancies substantially decreased with increasing resident year of training,” Dr. Behbahani said. “Finally, the turn-around time for generating radiology resident preliminary reports decreased as compared to turn-around times previously reported in the literature.”

Ultimately, results demonstrated that radiology resident on-call performance — with respect to diagnostic radiology interpretations — improves with the presence of 24/7 in-house radiology attending coverage. And in-house radiology attending coverage and supervision ultimately improves patient care, emergency room management/discharge time and appropriateness of management, researchers said.

Communication Key to Reducing Miss Rates

Missed radiologic findings are not uncommon in general, Dr. Behbahani said. A plethora of studies — including research on single radiologist interpretations — have shown miss rates as high as 19 percent, he said. “There is also literature which suggests that the studies that are preliminarily interpreted by radiology residents and subsequently reviewed and interpreted by an attending radiologist have shown lower rates of missed findings compared to that of an attending interpretation alone,” Dr. Behbahani said.

Keeping the rate of missed findings as low as possible benefits radiology on a number of fronts — from economics to patient care to the quality of resident education, Dr. Behbahani said. “At the critical level of resident education, this 24/7 in-house attending approach reinforces communication as a key driver in enhancing the call experience as a true learning platform.”

Personalized Breast Cancer Screening May Improve Outcomes, Reduce Exposure

By Mary Henderson

E keynote presentations by Rachel F. Brem, MD, director of Breast Imaging and Interventional Center at George Washington University; and Maxine S. Jochelson, MD, director of Radiology, Breast and Imaging Center, Memorial Sloan Kettering Cancer Center bookended seven presentations on multidirectional proactive communications delivered by residents and faculty.

“BRCA1 and BRCA2 are two different genes that confer life-long risk of breast cancer but cancers are harder to detect in dense tissue,” Dr. Brem said. “We must look at the intensity of the cure offered to breast cancer patients and evolve to a quality of care to the quality of economic conditions and controlled interruptions. This approach could range from using standardized imaging protocols and search patterns to adopting reading stations that offer optimal lighting, proper ergonomic conditions and controlled interruptions.”

And in-house radiology attending coverage significantly improves patient care, emergency room management/discharge time and appropriateness of management, researchers said.

Missed radiologic findings are not uncommon in general, Dr. Behbahani said. A plethora of studies — including research on single radiologist interpretations — have shown miss rates as high as 19 percent, he said. “There is also literature which suggests that the studies that are preliminarily interpreted by radiology residents and subsequently reviewed and interpreted by an attending radiologist have shown lower rates of missed findings compared to that of an attending interpretation alone,” Dr. Behbahani said.

Keeping the rate of missed findings as low as possible benefits radiology on a number of fronts — from economics to patient care to the quality of resident education, Dr. Behbahani said. “At the critical level of resident education, this 24/7 in-house attending approach reinforces communication as a key driver in enhancing the call experience as a true learning platform.”

In a study of high-risk women screened every six months alternating between MRI and mammography, 12 of 13 cancers in patients with the BRCA1 gene mutation were detected on MRI but none were identified on screening mammography. “Mammography was of no value to women with BRCA1,” she said. “For these patients, cutting back on mammography would not affect cancer detection and would reduce radiation exposure to the patient.”

Based on the findings, Dr. Jochelson said that eliminating screening mammography in BRCA1 carriers should be strongly considered, particularly in women under 40. She suggested screening BRCA1 carriers yearly with MRI from age 25 to 40 and then every six months alternating between MRI and mammography beginning at age 40.

Screening every six months with MRI may be better,” she said, but acknowledged that insurers are unlikely to reimburse for two MRI exams per year.

As an alternative, she suggested contrast-enhanced digital mammography (CEDM) as a replacement for routine screening mammography. A science session on contrast mammography and CT breast imaging (SS101) will be held Tuesday from 3 to 4 p.m. in the Arie Crown Theater.

"At the critical level of resident education, this 24/7 in-house attending approach reinforces communication as a key driver in enhancing the call experience as a true learning platform."

Siavash Behbahani, MD, MS

Rachel F. Brem, MD

“Ninety percent of breast cancer patients are cured of the disease based on five-year survival rates.”

“Ninety percent of breast cancer patients are cured of the disease based on five-year survival rates.”

Rachel F. Brem, MD

"BRCA1 and BRCA2 are two different genes that confer life-long risk of breast cancer; women with dense breast tissue are hidden," she said. “It’s a perfect storm. Women and whether women who carry the BRCA1 gene mutation benefit from screening mammography. "ACR guidelines for women with a 20 percent or higher risk of breast cancer suggest an MRI every year, which was a terrific starting point,” she said. “Now we’ve learned more and are able to fine-tune that.”

She reviewed the results of five prospective studies of MRI and high-risk women addressing the similarities between BRCA1 and BRCA2 carriers, whether MRI screening improves mortality reduction, how often to screen, and whether or not to include mammography. "BRCA1 and BRCA2 are two different diseases that should be screened differently," she said. "BRCA2 affects young patients and is not as easily detected at BRCA1.

In a study of high-risk women screened every six months alternating between MRI and mammography, 12 of 13 cancers in patients with the BRCA1 gene mutation were detected on MRI but none were identified on screening mammography. “Mammography was of no value to women with BRCA1,” she said. “For these patients, cutting back on mammography would not affect cancer detection and would reduce radiation exposure to the patient.”

Based on the findings, Dr. Jochelson said that eliminating screening mammography in BRCA1 carriers should be strongly considered, particularly in women under 40. She suggested screening BRCA1 carriers yearly with MRI from age 25 to 40 and then every six months alternating between MRI and mammography beginning at age 40.

Screening every six months with MRI may be better,” she said, but acknowledged that insurers are unlikely to reimburse for two MRI exams per year.

As an alternative, she suggested contrast-enhanced digital mammography (CEDM) as a replacement for routine screening mammography. A science session on contrast mammography and CT breast imaging (SS101) will be held Tuesday from 3 to 4 p.m. in the Arie Crown Theater.
Evolution of Machine Learning Will Strengthen Radiology

CONTINUED FROM COVER

“This point of singularity could happen in about 2029, just as Kurzweil predicted,” Dr. Dreyer said.

But even as he detailed the rapid evolution of machine learning (ML), Dr. Dreyer offered reassurance for radiologists fearing obsolescence. He recalled how, when IBM’s chess-playing computer Big Blue beat world champion Garry Kasparov in 1997, Kasparov noted that humans had made the machine that defeated him. After the defeat, Kasparov incorporated the computer’s analytical, unemotional approach into his game—an approach he named after the centaur, a creature from Greek mythology with the head, arms and torso of a man and the body and legs of a horse.

“Radiologists will be the centaur diagnosticians, allowing machines to make us smarter, help us do more and give us more value,” he said.

Clinical Data Science Critical to Radiology’s Evolution

The impact of computer learning will be most apparent at the crossroads of radiology and the emerging field of clinical data science, which encompasses the collection, transformation and analysis of clinical data. Earlier this year, Dr. Dreyer helped open the new MGH Clinical Data Science Center—part of a new approach to diagnosing and treating disease that uses cognitive computational algorithms such as ML and artificial neural networks to, in effect, call upon the shared expertise of hundreds of radiologists when reviewing a patient scan.

“There is a tremendous amount of applications for AI in radiology,” he said. “The radiology field itself is going to be the foundation of precision healthcare.”

For instance, once computers are trained to analyze solid lung nodules, images could be sent to a secure cloud and evaluated according to Lung Imaging Reporting and Data System (Lung-RADS) guidelines. With more than 9 million people eligible for lung cancer screening in the United States alone, pulmonary nodules represent an enormous potential application for AI—and that represents only a small fraction of radiological findings.

“Soon we will be able to create a precision radiology report for all body parts and all examinations,” Dr. Dreyer said.

Dr. Dreyer advised radiologists to ask for AI that not only automates but also augments what they do. Vendors, he said, should provide AI that improves reality, making a single procedure deliver even more value.

“We should use AI to expand our diagnostic and clinical roles,” he said, enhancing the radiologists role as the patients’ trusted advisor.

We should use AI to expand our diagnostic and clinical roles.

Keith J. Dreyer, DO, PhD

Radiology Offers Lessons to Entire Medical Industry for Digital Transformation

CONTINUED FROM COVER

Healthcare magazine in 2015. “Within a year or two, PACS eliminated the radiology rounds. Nobody said they should end, nobody speculated that they would. It just happened because physicians no longer needed to look at film,” he added.

Within a year or two, PACS eliminated the radiology rounds. Nobody said they should end, nobody speculated that they would. It just happened because physicians no longer needed to look at film.

Robert M. Wachter, MD

Dr. Wachter took away several lessons from that experience: digitization of the “thing” (in this case radiology reports) creates the opportunity for infinite distribution; social relationships and communication patterns that previously depended on gathering around the old technology will wither; and power relationships mediated by who controls the new technology will be renegotiated.

Dr. Wachter said he sees this pattern happening at his institution, estimating internists now spend half their time on computers. This results in physicians spending less time in hospital wards.

“There are no more doctors in the wards because they are no longer tethered there by paper charts, and therefore we left,” he said. The downside of this is that doctors become less visible, which can limit interaction with patients, families and nurses.

He said two things went wrong. First, technology was treated as technical change rather than adaptive change. Adaptive change requires users themselves to change.

Second, the industry is still in the early stages of adapting to healthcare information technology, which he broke into four stages. So far, only the first stage, digitalization of the medical record, has been reached. The remaining three stages are still to come: creating ubiquitous connectivity from the various digitalized parts from individual institutions, gleaning meaningful insights from the data, and, finally, converting those insights into action that improves value.

“The fourth part is the hardest—it involves changing the workflow, the training, the skills,” Dr. Wachter said. He added that because digital reports eliminated radiology’s monopoly on that information, the specialty is at risk of commoditization or replacement by cheaper alternatives. He said radiologists need to demonstrate their value to practicing physicians and patients.

“It’s not just that you get the reading correct, it’s that that reading leads to better, safer, cheaper care for patients,” he said. “That will be your savior.”

But while the risk of digital replacement is real, Dr. Wachter said he doesn’t see that happening anytime soon. Instead he said hybrid models where technology augments the work of people will be the norm for the foreseeable future.
EXPERIENCE
EDUCATION BEYOND...
RSNA 2016
VIRTUAL MEETING

Register for the RSNA 2016 Virtual Meeting, now featuring **25% more content, extended access**, and 13 CME-eligible courses on demand!

November 26 to December 2
Extended access through December 23 at 4 PM CT.

Venture Beyond the Traditional Meeting Experience:
RSNA.org/Virtual
See the answer, in high resolution.

AeroDR® HD Wireless Flat Panel Detector

The impressive high-resolution images that AeroDR® HD provides bring even the subtlest of details into crisp, clear view, for better decisions sooner in the care path. What’s more, this superb image quality involves no tradeoffs in panel size, weight, water-resistance or durability. Plus optional AeroRemote™ capabilities provide Active Monitoring, Live Notifications and Utilization Reporting to help you maximize system usage while minimizing downtime.

Smile for Ray the robot! Visit Exhibit 1919, South Hall A at RSNA 2016 for our roving robotic photographer to snap and email a digital photo of you.

konicaminolta.com/medicalusa