

100 INNOVATION
IS THE KEY
TO OUR FUTURE
RSNA 2015

Daily Bulletin

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Expanding the Definition of Innovation is Key to Growth in Healthcare

In an age characterized by slow growth, volatility and populism, the future of healthcare belongs to the people willing to invest in uncertainty during good times and bad, while moving quickly to improve productivity and outcomes, Jeffrey R. Immelt said during the New Horizons Lecture, "Redefining Innovation."

By Paul LaTour

NO MATTER WHERE you are around the world of healthcare, if you're looking for things to be stable or if you're looking for things to be certain, you're going to be waiting for a long time," said Immelt, the Chairman and Chief Executive Officer (CEO) at General Electric (GE).

Growth in healthcare traditionally came from improved technology in the equipment (which machine had the most slices per CT, which had the widest bore

"No matter where you are around the world of healthcare, if you're looking for things to be stable or if you're looking for things to be certain, you're going to be waiting for a long time."

Jeffrey R. Immelt, CEO, GE

for MR imaging, etc.). That's no longer the case.

"Those are still important, but only by taking those tools, adding the information and analytics, and turning them into new business models can we build a better future," Immelt said.

To that regard, the healthcare industry is still in the beginning stages of where analytics can take it, despite the continued growth happening in recent years.

He grouped the potential for innovation within radiology into three themes: precision medicine; the merger of radiology and pathology; and mobility to be global and local.

Immelt called precision medicine the "holy grail" for the radiology industry because of several factors. Among them is the development of radiogenomics, which allows for spotting a disease earlier, being more predictive around where disease will

take place and then marrying that with therapy.

"Over the past decades we truly see this coming into focus," Immelt said.

Looking back over time, Immelt said he's seen the fields of radiology and pathology move closer together. This is particularly true at the institutions pushing for technologies that have common tools.

Mobility remains an important theme, and Immelt said GE strives to meet that need by providing mobile diagnostic tools and devices.

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Jeffrey R. Immelt delivers New Horizons Lecture

Future of Imaging Interoperability Key to Improved Patient Care

If radiology images can't move from the patient to you, "then everything else you learn here is almost useless."

By Cindy Lenart

THAT WAS THE message Monday from David Mendelson, M.D., representative of the RSNA Integrating the Healthcare Enterprise (IHE) Board and member of the IHE USA Board, addressing attendees during the program "IHE Clinical Solutions for Interoperability: Imaging and Beyond, IHE or HIE, Does the Order Matter?"

The session was followed by the official announcement of RSNA's Image Share Validation Program, a conformity assessment program that will set the standard for consistency in the electronic image sharing marketplace. The Image Share Validation Program will test the compliance of vendors' systems using quality standards determined as most effective for accurate and efficient exchange of medical images.

According to Dr. Mendelson, image sharing is essential to give physicians the

"It's like a banking model for moving images instead of money. You use tokens, a card, a password—and money moves in a matter of seconds."

David Mendelson, M.D.

benefit of historical exams, counteract the growing cost of healthcare, reduce radiation exposure, and expedite clinical care.

Dr. Mendelson likened image sharing to financial institutions. "It's like a banking model for moving images instead of money. You use tokens, a card, a password—and money moves in a matter of seconds," he said.

An effective image sharing network should operate in much the same way, acting as a clearinghouse using IHE standards

that moves images over the Web, accessible with a token or password.

Angela Lianos, director of eHealth Ontario, said Ontario is already building an electronic health record and has established four imaging repositories. Currently all major public hospitals have integrated with the



David Mendelson, M.D.

system and many digitally enabled private, for-profit clinics that perform digital imaging are coming on board as well.

"The doctors are seeing the benefits of increased response time and reduced number of exams," Lianos said.

Last year alone, 12.5 million exams were loaded into the system, bringing the total to 62 million exams in storage. In this first phase of release, the emphasis is only on loading diagnostic reports through Web portals, with image loading set to begin in 2016.

"A journey, not a destination"

Key elements for developing such a network, according to Mariann Yeager, CEO of The Sequoia Project, an independent convener of industry and government with

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Radiation Safety

Tip of the Day

Patients who have many follow-up head CTs should be assessed for dose to the eyes as they swiftly become at risk for cataracts.

American Association of Physicists in Medicine

INSIDE TUESDAY



Is Workload Outpacing Reimbursement?
Study Analyzes the Data. 17A



Size-specific Fetal Dose
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Tuesday At a Glance

7:15–8:15
Hot Topics and Controversies Sessions
RSNA Diagnosis Live™

8:30–10:00
Educational Courses
Associated Sciences Educational Course (BOOST) Bolstering Oncoradiologic and Oncoradiotherapeutic Skills for Tomorrow—Breast, CNS
Essentials of Chest Imaging
Quality Improvement Symposium: *The Value of Practice Quality Improvement*

8:30–NOON
Series Courses
Breast, Cardiac, Emergency, Interventional, Musculoskeletal, Neuroradiology, Pediatric, Vascular

10:30–NOON
Informatics Courses
Scientific Paper Sessions
Resident and Fellow Symposium
Associated Sciences Educational Course (BOOST) Bolstering Oncoradiologic and Oncoradiotherapeutic Skills for Tomorrow: Integrated Science and Practice—Breast, CNS
Essentials of GI Imaging
Quality Improvement Symposium: *Designing and Running a Successful Practice Quality Improvement Effort*
Mexico Presents

12:15–1:15
Poster Discussions

12:30–2:00
Informatics Courses

1:30–2:45
Tuesday Plenary Session (Arie Crown Theater)
Presentation of Gold Medals (See Page 18A)
Annual Oration in Diagnostic Radiology
Trends and Developments Shaping the Future of Radiology
James H. Thrall, M.D.

1:30–3:00
Resident and Fellow Symposium
Associated Sciences Educational Course
Essentials of Musculoskeletal Imaging
Quality Improvement Symposium: *Common Mistakes in Practice Quality Improvement*

1:30–6:00
Interventional Oncology Series: Lung and Musculoskeletal

2:30–4:00
Informatics Courses

3:00–4:00
Scientific Paper Sessions



3:00–4:15
(BOOST) Bolstering Oncoradiologic and Oncoradiotherapeutic Skills for Tomorrow: Case-based Review—Breast, Head and Neck

3:00–6:00
Pediatric Radiology Series

3:30–5:00
Educational Courses
Associated Sciences Educational Course
Essentials of Cardiac Imaging

4:30–6:00
Educational/Informatics Courses

4:45–6:00
(BOOST) Bolstering Oncoradiologic and Oncoradiotherapeutic Skills for Tomorrow—CNS-eContouring

TUESDAY

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New Imaging Analysis Technique Provides Faster Treatment Assessment for Liver Cancer

A novel MRI analysis technique provides assessment of the effectiveness of liver cancer treatment far sooner than existing methods, according to preliminary results of a study presented Monday.

Richard S. Dargan

HEPATOCELLULAR carcinoma (HCC) is the second leading cause of cancer-related death worldwide. The many patients undergo treatment with transarterial chemoembolization (TACE), an image-guided procedure that blocks the tumor's blood supply while delivering chemotherapeutic drugs directly to the tumor. Identifying patients who don't respond to TACE is critical so that they can be treated again or have their therapy changed in a timely fashion.

"In clinical oncology, it is very challenging to assess tumor response to treatment," said study co-author Julius Chapiro, M.D., of the Yale University School of Medicine. "Up until now, we could measure the extent of tumor diameter or uptake with manual tools like the caliper on the screen, which are highly unreliable due to reader bias."

Dr. Chapiro and colleagues used the quantitative European Association for the Study of the Liver (qEASL) technique, a new 3-D approach the researchers developed in collaboration with Philips Research North America that provides whole liver volumetric enhancement quantification on MRI.

"The radiologist can segment the entire tumor with the assistance of the computer," said Dr. Chapiro. "It's a work-flow efficient, semi-automated process that takes 15 to 20 seconds to segment and allows you to delineate the tumor in 3-D."

The researchers used qEASL on 68 liver cancer patients with infiltrative HCC to measure treatment response and predict survival. The ill-defined borders and the sheer number of lesions in infiltrative HCC



Susanne Smolka

can pose a challenge in treatment response assessment after TACE with traditional methods.

"Up until now we haven't had any kind of objective measurement for infiltrative liver cancer," said study co-author Susanne Smolka, one of several medical students from Charité University Medicine in Berlin who worked on the project at Yale through a grant from the R.W. Günther Foundation. "This new technique is quantitative and we can apply it to the whole liver, giving us for the first time an objective measurement."

The patients underwent qEASL before and one month after their first TACE. The whole liver was segmented and viable tumor was identified by the degree of enhancement above surrounding healthy liver tissue. The researchers set a threshold of a 65 percent reduction in viable tumor between baseline and follow-up MRI to separate responders from non-responders.

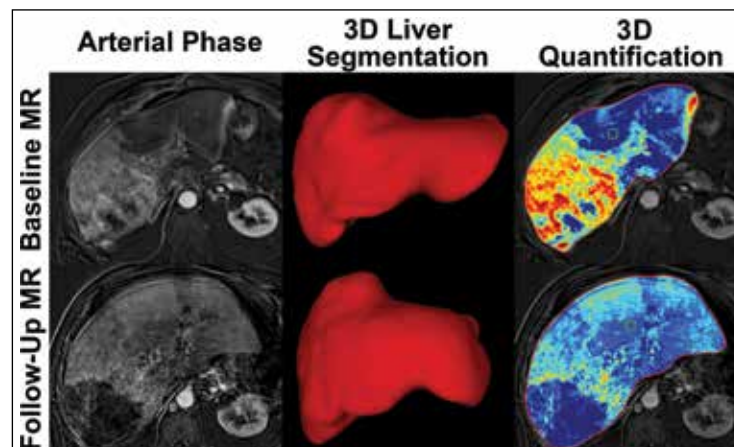
Responders had an overall survival of approximately 21 months, compared with 6.8 months in non-responders, and a mean 57.8 percent decrease in enhancing volume, compared with a 19.1 percent increase in non-responders on average.

"The findings show that quantitative tumor enhancement is possible with 3-D qEASL and can predict survival after TACE for infiltrative and multifocal HCC," Dr. Chapiro said.

Dr. Chapiro emphasized that qEASL is not a diagnostic tool but rather a means of comparing differences before and after treatment to identify non-responders.

"The earlier the non-responders are identified and treated, the better their outcomes," he said.

Along with liver cancer, the approach has been validated for benign brain and uterine lesions and also could be applied to systemic therapy. It can be used with addi-



Liver images captured before (top row) and after (bottom) treatment. The bottom right image shows less cancer after treatment, as evident by the reduction in red and yellow areas.

tional imaging modalities like cone-beam CT, MDCT, and SPECT, according to Jeff Geschwind, M.D., principal investigator of the project and chairman of the Department of Radiology and Biomedical Imaging at Yale.

"With this tool, we started a small revolution in how we use follow-up imaging in clinical cancer management, not only for local but for all cancer therapies," Dr. Geschwind said. "Most importantly, we are now looking at the broad clinical application of qEASL, which has now been introduced to the community as a commercially available product."

The study is one of several at this year's annual meeting resulting from a unique academic-industry partnership between researchers in the Yale Radiology laboratory of Dr. Geschwind and Philips scientists like Ming De Lin, Ph.D.

DTI Could Help Those at Risk for Long-term Problems Resulting from Head Injury

Unlike standard imaging techniques, diffusion tensor imaging (DTI) can uncover the underlying pathology for traumatic brain injury (TBI) and mild traumatic brain injury (mTBI). Two studies presented Monday showed the potential role DTI could play in helping people most at risk for persistent, long-term problems that result from a head injury.

By Paul LaTour

Between 15 and 30 percent of people suffering TBI or mTBI (concussion) will have continued problems resulting from the injury, a group termed the "miserable minority," according to Michael L. Lipton, M.D., Ph.D., the principal investigator for both studies.

"The biggest conundrum in TBI research and clinical care is who is going to recover and who is part of that miserable minority," said Dr. Lipton, the associate director of the Gruss Magnetic Resonance Research Center and director of radiology research at Albert Einstein College of Medicine (Einstein) and Montefiore Medical Center in the Bronx, New York.

"We'd like to know who they are up front rather than waiting it out for the effects to present," he added. "Then maybe we can protect people who may be more vulnerable or intervene early to arrest the degeneration of axons that underpins long term neurobehavioral problems."

Early Signs of Abnormalities Relate to Long-Term Outcomes

DTI abnormalities around the time of injury are significantly related to long-term

outcomes, according to Sara B. Rosenbaum, M.D., a radiology resident at Montefiore Medical Center who presented one of the studies.

"Prospective identification of those at risk may allow for improved patient management and inform treatment trials," Dr. Rosenbaum said.

The researchers recruited 31 mTBI patients from a local emergency center as well as 40 healthy volunteers. DTI at 3 Tesla was performed within two weeks of injury, and cognition was tested at one year post-injury.

Subjects were classified based on presence or absence of abnormally high radial diffusivity (RD) within two weeks of injury in selected brain regions (left frontal, right frontal, left temporal, right temporal and corpus callosum). T-tests compared cognitive outcomes between subjects with or without abnormally high RD in each region.

The results showed subjects with abnormally high RD in the left temporal and



Sara B. Rosenbaum, M.D.



Eva Catenaccio

right temporal lobes performed worse on cognitive tasks at one year post-injury.

"These results suggest that individualized quantitative analysis of DTI in the setting of mTBI might ultimately aid in mTBI prognostication," Dr. Rosenbaum said. "DTI could thus, if

further study confirms its prognostic value, be used as a noninvasive biomarker in the acute setting to identify those who will have poor long-term outcome."

Gender Plays Role in Negative Long-term Effects of TBI

In a related study done at Einstein, researchers found that gender is a potential risk elevator for the negative long-term effects of TBI, specifically that women have a higher risk than men.

The researchers studied 41 females and 41 age- and education-matched males (ages 18-52) drawn from an ongoing longitudinal study of repetitive head impacts on amateur soccer players. Their inclusion included a questionnaire that estimated the number

of headers performed over the prior 12 months.

Analysis following 3T DTI imaging and neurocognitive testing revealed that women appear to have a greater response to repetitive head impacts for the same amount of heading. The researchers found more evidence of white matter microstructural damage and worse cognitive performance in women compared to men.

"The overall goal is to generate guidelines for safe heading exposure," said Eva Catenaccio, a fourth-year medical student at Einstein who presented the research. "These results demonstrate that these guidelines need to be sex-specific."

The potential impact of the study's results, though preliminary, could extend beyond sports. It could help end a persistent myth that women have worse TBI outcomes than men because they are more likely to complain about the symptoms.

"Women aren't making it up or exaggerating," Catenaccio said. "Many of the symptoms are vague, so they are hard to quantify, thus easier to dismiss. This research shows that there really is something going on organically in the brain that underlies these symptoms. And, it affects women to a greater extent than men."

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Radiology Imaging Education Focus of International Panel

By Felicia Dechter

WITH EACH BRINGING A different experience to the table, a panel of experts from around the globe also found a lot of common ground in their approach to educating the next generation of radiology students during Monday's International Trends Session.

Radiology education should be interesting, interactive, incorporate technology and e-learning, be simple when possible, and above all, patient-centered, according to presenters gathered to discuss "International Medical Student Imaging Education."

Each year the International Trends meeting is held on a topic of global importance to the profession.

In discussing the basics of teaching medical students about radiologic equipment and radiology protection in the U.K., Christiane Nyhsen, M.D., consultant radiologist at City Hospitals Sunderland NHS Foundation Trust and senior lecturer at Newcastle University, stressed the importance of keeping students' attention.

"Share the challenges of what low-dose radiation risks may or may not be," Dr. Nyhsen said. "Tell them about studies in geographic areas of high background

radiation. Mention radiation spas, emerging evidence of how the human body responds to low levels of radiation. It is quite fascinating in my opinion."

Radiological equipment is best taught alongside real cases, Dr. Nyhsen said. Interactive discussions help keep students interested. Keep it interesting, keep teaching interactively and be clear about the evidence regarding risk of low-level of radiation, she said.

And make sure to put patients first, she added. "Put the patient in the center of teaching," Dr. Nyhsen said. "Imaging should help the patient—the patient should be considered, advised, have tests appropriately explained and fears reduced."

Petra Lewis, M.B.B.S., discussed the introduction of medical imaging into anatomy and more specifically, offered her opinion on when it should be introduced, why it should be incorporated, who should teach it, and how it should be taught.

"The 'when' is easy," said Dr. Lewis, of the Geisel School of Medicine at Dartmouth, in Hanover, New Hampshire. "It should start on Day One of the anatomy course and preferably Day One of medical school."

Medical imaging should be incorporated early into preclinical curriculum since all medical students will use it either directly or indirectly their entire careers, Dr. Lewis said.

Radiologists should be teaching anatomy as well as medical imaging, Dr. Lewis said. All modalities can be used to teach anatomy depending on the organ system.

Keep it Simple, Use E-Learning

Simplification is the key to introducing the basics of medical imaging technology, dose and safety, said Francesco



Sardanelli, M.D., a professor of radiology at the University of Milan, Italy.

"We should try to reduce complexity to simplicity," Dr. Sardanelli said. "We need to present the meaning of words we use, to explain to students the risk of the MR environment and translate the numbers to something easy to understand. One example is better than 20 lines of text."

In Japan, lecture-theatre style education is still dominant in radiology, said Kunihiro Fukuda, M.D., a professor of radiology at the Jikei University School of Medicine in Tokyo. However, "It is desirable to create more e-learning materials, and use them effectively in the flipped education style," Dr. Fukuda said. "If the lecture style will be continued, radiology should be integrated with clinical medicine and pathology."

Medical education is six years in Japan, said Dr. Fukuda. Radiation physics and biology start at early stages in lecture style, he said, while imaging diagnosis and radiation oncology start usually from year four. "They are usually started with lecture style, and then tutorial and/or elective course," said Dr. Fukuda.

"One example is better than 20 lines of text."

Francesco Sardanelli, M.D.



Researchers Develop Size-Specific Fetal CT Dose Calculator for Pregnant Patients

A method to easily and accurately estimate size-specific fetal dose for CT exams using tube current modulation (TCM) on pregnant patients was presented by researchers at a Monday session.

By Ed Bannon

PRESENTER KYLE MCMILLAN, PH.D., of the University of California, Los Angeles (UCLA), and colleagues developed patient size-specific, scanner-independent conversion coefficients for CT dose index volume (CTDI_{vol}) to fetal dose. The coefficients were developed for abdominal and pelvic CT exams of pregnant patients who had a gestational age ranging from 12 to 36 weeks.

Plugging the patient size as measured by water-equivalency displacement and the CTDI_{vol} into a formula developed by this research will calculate the patient-specific dose, said Dr. McMillan in the standing-room only session of 200-plus people.

"That's a heck of a lot easier than doing a Monte Carlo simulation," Dr. McMillan said. "A doctor may take these measurements and generate a patient-specific dose estimate, which may provide some comfort to patients."

Dr. McMillan conducted the research as part of his doctoral dissertation under the supervision of Michael McNitt-Gray, Ph.D., of UCLA, who also attended the RSNA 2015 session.

Estimating Patient-Specific Dose

Fetal dose estimates have been limited to fixed tube current CT exams of pregnant patients even though nearly all other CT



Kyle McMillan, Ph.D.

exams are performed using TCM. The UCLA researchers collected data to determine normalized CTDI_{vol} for TCM scans and incorporated the water-equivalent diameter (WED) measurement available on most CT equipment to calculate a patient-specific dosage.

Researchers created models of fetal anatomy from image data from 18 pregnant women who had undergone abdominal/pelvic CT. They estimated fetal doses for each model using Monte Carlo simulations of fixed tube current CT scans with a 64-slice MDCT scanner.

Predicted TCM schemes were generated for each pregnant patient model using a validated method accounting for patient attenuation and scanner limits to determine TCM functions for each voxel-

"A doctor may take these measurements and generate a patient-specific dose estimate, which may provide some comfort to patients."

Kyle McMillan, Ph.D.

ized model, Dr. McMillan said. The validated method involves yet-to-be published research that is part of Dr. McMillan's doctoral dissertation. Fetal doses were normalized by scan-specific 32 cm CTDI_{vol} values

based on the average tube current across the entire scan (scanner-reported CTDI_{vol}) to obtain scan technique-independent CTDI_{vol}-to-fetal-dose conversion coefficients for each patient.

WED can be reliably incorporated into the dose measurement so radiologists can generate patient-specific dose, instead of

relying on models. The study found a positive correlation between the normalized dose and the WED. Using models when determining doses for organs is acceptable, but a patient-specific calculation for fetal dose provides more accurate information since the fetus is always growing, Dr. McMillan said.

"A reasonably accurate dose to the fetus can be obtained by knowing simply the scanner output and the size of the patient expressed in this water-equivalent diameter," Dr. McNitt-Gray said.

Although using WED in the dose calculation is not standard on all scanners, Dr. McNitt-Gray hopes that research showing the usefulness of the function will encourage physicians to request the measure and persuade manufacturers to incorporate it into all scanners.

Medical Physics

Question of the Day

Q I want to change the MR imaging parameters for a new protocol based on a research paper I read, but the console says the SAR is too high. What is SAR?

[Answer on page 16A.]



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Digital Breast Tomosynthesis May Improve Detection, Outcomes

Digital breast tomosynthesis (DBT) used with digital mammography may over time detect more cancers, and more clinically significant cancers, than digital mammography (DM) alone, the current standard of care, according to a study presented Monday by researchers from the University of Pennsylvania

By Elizabeth Gardner

THE STUDY SOUGHT TO BUILD on previous studies showing that DBT/DM screening leads to decreased recalls and increased cancer detection. Because few studies have evaluated the sustainability of these outcomes, the researchers compared DBT/DM with DM alone at one, two and three years. The study found that DBT screening resulted in increased cancer detection and positive predictive value over time. It also showed a decrease in interval cancer rate within one year of screening, suggesting that DBT detects more clinically significant cancers earlier.

"These improvements in outcomes directly address the major criticisms of mammographic screening: too many false positives and too few cancer detections," said presenter Emily Conant, M.D., chief of the division of breast imaging at the Hospital of the University of Pennsylvania (HUP). "By improving these outcomes, DBT tips the benefit-risk ratio even further in supporting routine DBT screening of women for breast cancer."

Since 2011, HUP has used a DM/DBT



Emily Conant, M.D.

cancer detection, positive predictive value, biopsy rates, and interval cancer rates within one year. A positive screen was defined as a recall prompting a biopsy recommendation. Network cancer registry data was used to determine interval cancer rate.

The study population had a mean age of between 56 and 57, and was about half black and 40 percent white. About 56 percent had scattered fibroglandular breast density and another 30 percent had heterogeneous density.

combination for all screening mammograms. The study analyzed 33,000 screenings in the three years—about 11,000 per year—after the conversion, and compared results with prior DM rates on several measures: recall,

Recall rates decreased over all three years. The baseline DM rate was 10.4 percent, and the DBT rate was 8.8 percent for the first year, 9 percent for the second year, and 9.2 percent for the third. Cancer detection rates per 1,000 screened continued to increase from a baseline DM rate of 4.6 to 5.5 for DBT year 1, 5.8 for year 2, and 6.1 for year 3.

The biopsy rate remained relatively stable, and positive predictive value continued to increase over the three years. The interval cancer rate decreased from 0.9/1000 screened for DM to 0.5 for DBT year 1, and 0.1 for DBT year 2. There is not yet adequate follow-up to calculate interval cancer rate for DBT year 3.

Dr. Conant said she would like to see the study repeated in multiple centers to greatly expand the volume of data.

An audience member queried Dr. Conant about the danger of reader "burn-out" from constant exposure to the vast amounts of information generated by DBT studies.

The HUP group, which reads 70 to 80 screening studies a day interspersed with about 60 diagnostic studies, has found that the learning curve for interpreting DBT

information may be as long as two years, Dr. Conant said. However, the volume of information has not, in itself, presented a problem. "Over time, DBT becomes a very task-driven tool," she said. "You

look at the 2-D images for global things and they look very differently through the DBT stack," Dr. Conant said. "So we have not experienced burnout. We are still thrilled with DBT and we think it's the new standard of care."

These improvements in outcomes directly address the major criticisms of mammographic screening: too many false positives and too few cancer detections.

Emily Conant, M.D.

"Balance Sheet" Weighs Benefits vs. Risks in Breast Screening

An evaluation of mortality reduction and over-diagnosis rates among women in the Norwegian Breast Cancer Screening Program (NBCSP) found that the benefit-harm ratio between the two rates averages out to about one life saved for every two women over-diagnosed, according to research presented Monday.

By Mike Bassett

IN HER PRESENTATION Solveig Hofvind, Ph.D., a researcher at the Cancer Registry of Norway, said the study was designed to estimate a "balance sheet" of the benefits and harms—a subject of continuing debate—to women targeted by the NBCSP.

Dr. Hofvind and colleagues used data from published studies using individual level data from the NBCSP to evaluate the reduction in breast cancer mortality compared to over-diagnosis.

Dr. Hofvind and colleagues determined that for every 10,000 women screened that between 53 and 61 lives were saved from breast cancer, while between 45 and 126 women were over-diagnosed. Furthermore, 1,590 showed false positive results with a non-invasive assessment, while 410 showed a false positive result with an invasive procedure.

They determined that the benefit-harm ratio between mortality reduction and over-diagnosis varied from 0.4 to 1.4 depending on mortality reduction and over-diagnosis estimates. The 0.4 ratio includes the lowest mortality and highest over-diagnosis estimates and represents about 2.4 women over-diagnosed per life saved from breast cancer, while the 1.4 ratio includes the highest mortality and lowest over-diagnosis estimates and represents less than one woman over-diagnosed per life saved.

Trying to come up with such a benefit/harm ratio needs to be approached with



Solveig Hofvind, Ph.D.

extreme caution, she said, because of the variability in the study results used for the estimates and because of different ways in which over-diagnosis can be measured.

"So which ratio do we expect and which ratio are we willing to accept?" she asked. And she also wondered "who we are" since a woman in a physician's office worried

about breast cancer might have a different perspective than a physician or health policy maker.

And considering the number of variables associated with the estimates used to come up with such a ratio she questioned

whether attempting to come up with this kind of balance sheet is a valid exercise.

"Is it even appropriate to estimate a ratio between lives saved from breast cancer death and epidemiologic over-diagnosis?" she asked.

Research Evaluates False Negatives

In another study presented Monday, Hannah Perry, M.D., a radiology resident



Hannah Perry, M.D.

at Beth Israel Deaconess Medical Center in Boston, pointed out that published data regarding breast cancer and false negative mammograms doesn't reflect current U.S. practice, but instead relies on data from programs that follow a European screening model or use film-screening mammography.

"So we wanted to try to evaluate the false negative rate in screening mammography in an American academic institution," she said. "And going deeper, we wanted to identify any characteristics of these false negative cases that may help improve the sensitivity of our breast screening programs."

In the study, Dr. Perry and colleagues evaluated patients diagnosed with breast cancer during an 18-month period from 2011-2012 who had a negative mammogram within 15 months prior to diagnosis.

Cases were classified as either true negative or false negative based on the consensus findings of five dedicated breast imagers.

Of the 125 patients who met the inclusion criteria, 97 cases were classified as true negative while 28 were false negative. Dr. Perry and her colleagues determined that the 22 percent false negative rate was within previously published rates of approximately 13 to 35 percent.

"In looking at the cases that were false negative, all were considered to be from reader error based on reader reviews of the five breast imagers," Dr. Perry said. "We concluded there were no distinguishing mammographic features among the false negative cancers."

"Moving forward we are going to be looking at more cases and trying to see if we can find any information about the distinguishing characteristics of these false negative cancers," she said.

RSNA Spotlight Course in Cancun



RSNA 2015 attendees have some fun posing with the poster for RSNA's new course to be held in June in Cancun, Mexico. The course, "RSNA Spotlight: Advances in Emergency Radiology," is designed to provide high-quality education to radiologists in Latin America, and will be presented in Spanish. Jorge A. Soto, M.D., Boston, and Guillermo Elizondo-Riojas, M.D., of Monterrey, Mexico, will serve as course directors.

More to See at RSNA 2015: Explore Sessions in Every Subspecialty

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

BIOMARKERS/QUANTITATIVE IMAGING

RC803D (Educational Course)

4-D Flow MRI Quantification?

Friday, Dec. 4, 8:30-10:00 a.m.

Room E350

MRI FLOW IMAGING is based on flow-sensitive, phase contrast sequences. In this session, presenters will introduce the basic MRI physics responsible for imaging flow, extending 1-D flow imaging to 3-D flow imaging used in 4-D flow MRI. Presenters will use examples from valvular and congenital heart disease to illustrate the use of 4-D flow MRI to quantify flow velocities and volumes.

BREAST

RC515 (Educational Course)

Breast Imaging: Politics and Practice

Wednesday, Dec. 2, 8:10-10:00 a.m.

Room E450A

PRESENTERS WILL discuss topics related to breast imaging politics and practice in three sessions:

- **Current Controversies.** Presenters explore evidence supporting screening mammography as it is currently practiced in the U.S., overdiagnosis of breast cancer through screening and the use of MRI and ultrasound in screening high-risk women.
- **Economic Challenges.** This session covers fundamentals of healthcare payment policy impacting breast imaging, recent developments in payment policy and possible future directions.
- **Breast Density.** Grassroots political efforts of women with dense breast tissue, imaging options for women with dense tissue and political implications of breast cancer risk due to breast density are covered.

CHEST RADIOLOGY

SPSC45 (Educational Course)

Controversy Session: Current USPSTF Lung Cancer Screening: Inclusive or Exclusive

Wednesday, Dec. 2, 4:30-6:00 p.m.

Room S404AB

Presenters take on both sides of the U.S. Preventative Services Task Force (USPSTF) lung cancer screening recommendations in two sessions:

USPSTF Lung Cancer Screening, Pro: The session will cover the potential advances of the inclusivity of USPSTF lung cancer screening eligibility criteria, the spectrum of lung cancer risk among patients meeting USPSTF criteria and how personalized risk assessment can facilitate shared decision making for patients meeting the criteria.

USPSTF Lung Cancer Screening, Con: The session will cover the rationale for the USPSTF criteria, the importance of identifying risk among those referred for lung cancer screening, the impact of lung cancer risk on the balance of harms and benefits of lung cancer screening and the clinical and demographic traits that increase the risk for lung cancer.

CH141-ED-X (Education Exhibit)

Essentials of Lung Cancer Screening with Low-dose CT

All Day-Chest (CH) Community, Learning Center

PRESENTERS WILL REVIEW the outcomes of major lung cancer screening trials and evaluate benefits and risks of screening; discuss low-dose CT scanning techniques and strategies for dose reduction; and review current screening guidelines, recommendations and reporting and management standards.

EMERGENCY RADIOLOGY

ER153-ED-X (Education Exhibit)

Dose Reduction Techniques for Head CT Following Traumatic Brain Injuries

All Day-Emergency Room (ER) Community, Learning Center

PRESENTERS WILL REVIEW methods used to decrease the dose of head CTs used to follow traumatic brain injury by decreasing the kV and mAs and using iterative reconstruction to decrease noise and artifact; demonstrate that there is no significant difference in the diagnostic quality of the lower dose head CTs with filtered-back projected or iterative reconstructed images; and review additional traditional methods of reducing dose to radiosensitive organs such as the eyes and thyroid gland.

GASTROINTESTINAL RADIOLOGY

RC509-03 (Educational Course)

Oral Contrast Media Concentration Selection for Low kVp/keV CT Scanning

Wednesday, Dec. 2, 9-9:10 a.m.

Room 350

ORAL CONTRAST MEDIA (OCM) is commonly used for abdominal CT. Clinical implementation of low-kVp/dual energy CT (DECT) imaging demands adjustments in OCM concentration. In this session, presenters research the impact of low X-ray energy (kVp/keV) on OCM using phantom and clinical data and to assess optimal OCM concentrations for low-energy diagnostic CT scans.

GENITOURINARY RADIOLOGY

SPSC44 (Educational Course)

Controversy Session: Prostate Imaging: Just What MR Technique is Best?

Wednesday, Dec. 2, 4:30-6:00 p.m.

Room E450A

PRESENTERS WILL review techniques that comprise high-quality multiparametric MRI (mpMRI) of the prostate. More specifically, they will explore the key protocol questions necessary to set up mpMRI in a radiology practice. After an introduction and overview of mpMRI, sessions will cover:

- **1.5T vs 3T Imaging: Pros and Cons**
- **Diffusion Weighted Imaging**
- **Dynamic Contrast-Enhanced Imaging**
- **Imaging of Recurrence in Prostate Cancer**

SPSH40 (Educational Course)

Hot Topic Session: Molecular Imaging and Radionuclide Therapy for Prostate Cancer

Wednesday, Dec. 2, 7:15-8:15 a.m.

Room E451A

RADIUM-223 IS a recently approved therapy for treatment of bone metastases in patients with metastatic prostate carcinoma. In this session, researchers present findings on:

- **Ra-223 Therapy for Skeletal Metastases from Prostate Cancer**
- **Comparison of Ga-68 and F-18 Labeled Small Molecule PSMA Tracers for Prostate Cancer Imaging**
- **PSMA Ligands for Imaging and Therapy of Prostate Cancer**



INFORMATICS

RC553 (Educational Course)

Next Generation IT to Improve Quality and Safety

Wednesday, Dec. 2, 8:30-10:00 a.m.

Room S405AB

RADIOLOGY HAS BEEN a leader in the adoption and meaningful use of interoperable health information technology (IT) tools supported by federal regulations as part of Health Information Technology and Economic Health Act (HITECH). Presenters will review key, next-generation health IT requirements to improve quality of care and patient safety while reducing waste and use case examples to demonstrate how health IT tools can be used to improve access to imaging, appropriateness of imaging ordering and radiology report value. Enhancing communication of critical test results and enabling appropriate follow-up imaging and care coordination for patients will also be covered.

NEURORADIOLOGY

SSQ17-02 (Scientific Session)

Default Mode Network Structural-functional Connectivity and Beta-Amyloid Pathology in Autosomal Dominant Familial Alzheimer's Disease

Thursday, Dec. 3, 10:40-10:50 a.m.

Room N229

EARLY ONSET FAMILIAL Alzheimer's disease (FAD) is inherited in an autosomal dominant manner and provides a model for studying how amyloid may affect disease onset and synaptic failure. Using data from Dominantly Inherited Alzheimer's disease Network (DIAN), presenters evaluate relationships between

structural connectivity, functional connectivity and amyloid burden. *This research received the RSNA Award for Trainee Research Prize—Resident.*

NUCLEAR MEDICINE

SPNM61 (Educational Course)

Theranostics: Contributions of Diagnostic Nuclear Medicine and Targeted Radionuclide Therapy in Clinical Oncology (In Conjunction with SNMMI)

Friday, Dec. 4, 8:30-10 a.m.

Room S504AB

AN IMPORTANT ASPECT of nuclear medicine and molecular imaging is that the same core compound of the administered radiopharmaceutical can be labeled with gamma emitters (for diagnostic) and beta (or alpha) emitters (for therapy), allowing for targeted treatment of lesions. This is an expression of theranostics—the combination of therapy and diagnostics that is based on the specific tumor biology of each patient's disease. Held in conjunction with the Society of Nuclear Medicine and Molecular Imaging (SNMMI), these sessions will offer several examples of such paired diagnostic studies and treatments using nuclear medicine methods:

- **Radioactive Iodine and Thyroid Cancer—Current Use and Controversies**
- **Bone Scintigraphy and the Use of Radionuclides in the Management of Patients with Metastatic Castrate-Resistant Prostate Cancer**
- **Updates on the Use of PET/CT (and PET/MRI) and Radioimmunotherapy in Non-Hodgkin's Lymphoma**
- **Peptide Receptor Radionuclide Imaging and Therapy: Where Are We in Europe and What Shall the U.S. Do to Catch Up?**
- **Selective Internal Radiation Therapy for Hepatic Malignant Lesions**

RADIATION ONCOLOGY

RO262-SD-THB2 (Scientific Poster Discussion)

Glucosamine Augments Sensitivity of Cancer Cells to Radiation

Thursday, Dec. 3, 12:45-1:15 p.m.

Radiation Oncology (RO) Community, Learning Center

GLUCOSAMINE, a supplement commonly used for the treatment of osteoarthritis, has been shown to decrease the incidence of adenocarcinoma of the lung and colon, and has also shown to be toxic to cancer cells in vitro at concentrations attainable in humans. Researchers explore the potential of using the nutritional supplement to enhance cancer treatment and investigate whether it is safe for patients to take this supplement while receiving radiation therapy.

Subspecialty content brochures will be available in the Grand Concourse Lobby, Level 3; Lakeside Center, Level 3 and Learning Center.

Residents/Fellows Share Their Favorite Parts of the RSNA Annual Meeting

The Daily Bulletin hit the Residents Lounge on Monday to ask doctors the question: What are you looking forward to most at RSNA 2015? Although their answers were as varied as the countries from which they came, most wanted to meet new people, check out the latest technology and further their education in their particular field.



"I want to first look at new things—innovations that relate to my field. And the networking is why I really want to come," said **Suha Ghouli, M.D.**, a second-year fellow at Western University in London, Ontario.



"Mostly the educational courses and the interactive sessions related to interventional radiology and—of course—the social meetings and nights out," said **Mohammad Ali Husainy, M.D.**, a final year resident at Kings College in London, England.



"The educational exhibits and visiting Chicago and meeting other residents and other doctors," said **Ane Ugarte Nuno, M.D.**, a second-year resident at the Hospital Donostia in San Sebastian, Spain.



"I want to learn intervention in the workshops and meet new people and see the new technology and machines," said **Saurav Bhagat, M.B.B.S.**, a second-year resident at the Medical College Hospital in Lucknow, India.



"My plan is to participate in the resident fellow review case which they have every day. And it's a good opportunity to look at the poster presentations to see what people are doing," said **Arash Bedayat, M.D.**, a fourth-year resident at the University of Massachusetts, in Franklin, MA.



"The case reviews should be interesting—to see the work of other people in my field and learn what they are doing," said **Bahar Mansoori, M.D.**, a second year resident at the University Hospitals Case Medical Center in Cleveland. "I enjoy meeting other residents coming from Europe to see what they're doing, talking to other residents and comparing, and networking, seeing people and presenting my work."



"I like to hear cutting-edge research about my subspecialty so I can get new ideas about what's going on. I can polish my own research and get new ideas about new topics," said **Daddy Mata-Mbemba, M.D.**, a second-year fellow at Tohoku University in Sendai, Japan.



"I'm looking for new stuff, different points of view and meeting people from all over the world with the same interests," said **Ezequiel Mailand, M.D.**, a third-year resident at the Institute of Jaime Slullitel, in Rosario, Argentina.

Resident and Fellow Symposium Spotlights Job Opportunities, Challenges

This year's RSNA Resident and Fellow Symposium explores career issues critical to residents entering the job market. Coordinated in part by the RSNA Resident and Fellow Committee (RFC), this year's symposium has been restructured to separate the day-long session into two sections with a break in between. All sessions are held Tuesday, Dec. 1, in Room E451B.

Career 101: Essentials for Every New Attending Radiologist (an Interactive Session)

10:30 a.m. to Noon (attendees should bring a mobile wireless device to participate)

• 8 Reasons to be Optimistic About the Future of Radiology

Presenters Jonathan W. Berlin, M.D., M.B.A., and Amelia Wnorowski, M.D., will discuss key reasons radiologists are essential in new payment systems and provide a comparative analysis of radiology and other occupations.

• Medical Malpractice: Common Pitfalls New Attending Radiologists Should Avoid

Leonard Berlin, M.D., J.D., will discuss the standard of care, common and uncommon events that lead to medical malpractice, the role of expert witnesses in a malpractice lawsuit and minimizing the likelihood of being accused of malpractice.

Career 102: Essentials for Residency and Job Success

1:30 to 3:00 p.m.

• How to Convert an Interview Into a Job Offer

Fred T. Lee Jr., M.D., will discuss the interview process and strategies for maximizing success in the job market.

• Six Must-Know Strategies for Success Every Radiology Trainee Should Master

Richard E. Sharpe Jr., M.D., M.B.A., will focus on key areas and strategies critical to success and accomplishing goals.

• Candid, Frank and Personal Job Advice from Recent Grads

The session features a 30-minute Q&A with Nancy Benedetti, M.D., Candice Bookwalter, M.D., Ph.D., and two other recent graduates.



STOP BY THE LOUNGE

Residents and fellows relax and network while enjoying complimentary refreshments in the Residents Lounge, open from 8 a.m. to 6 p.m. through Thursday.

Explore Resident, Fellow Sessions at RSNA 2015

A full spectrum of RSNA 2015 sessions spotlight issues relevant to radiology residents and fellows. Among them:



MS170-ED-X (Education Exhibit)

Fat Containing Lesions in the Abdomen and Pelvis: A Fat-tastic Resident Primer

All Day—Multisystem & Special Interest (MS) Community, Learning Center

FAT SEEN in both benign and malignant lesions in the abdomen and pelvis can create diagnostic and prognostic implications. This exhibit explores the principals of fat detection CT - Hounsfield units MRI - and various techniques for fat suppression.

HP221-SD-TUB1 (Educational Course)

Identifying Key Components of Medical Student Radiology Education for an Improved Experience—Comparison of Responses from Radiology Educators and Medical Students

Tuesday, Dec. 1, 12:45 to 1:15 p.m.—Health Services, Policy, Practice & Research (HP) Community, Learning Center, Station #1

ALTHOUGH MANY educational activities, tools and assessments have been described as critical to the success of a radiology medical school experience, the value of these resources to radiology educators and medical students remains unassessed. Presenters explore how various educational components—including the degree of student participation, types of performance evaluations, barriers to student participation, and factors that best create a meaningful learning experience—are valued by both educators and students.

NR132-ED-X (Education Exhibit)

The Radiologist's Role in Shunt Evaluation: A Resident Primer and Review of What the Neurosurgeon Wants to Know

All Day—Neuroradiology/Head & Neck (NR) Community, Learning Center

ALONG WITH REVIEWING clinical indications for shunting, types of shunts and shunt devices and providing

photos of select devices and their radiographic correlates, presenters will review common clinical scenarios requiring radiographic evaluation of shunts, provide case examples and review neurosurgical interventions in a shunted patient. Specific instances where the radiologist can aid the neurosurgeon in diagnosis and treatment planning for shunted patients will also be covered.

QS122-ED-TUA4 (Quality Storyboard)

High-Fidelity Contrast Reaction Simulation Training: A Single Department's Experience in Training all Faculty, Fellows, and Residents to Improve Patient Care and Satisfy PQI Requirements

Tuesday, Dec. 1, 12:15-12:45 p.m.

Quality Storyboards (QS) Community, Learning Center, Station #4

PRESENTERS REPORT the results of a department-wide high-fidelity simulation project designed to increase patient safety and radiologist education for the recognition and management of contrast reaction. The quality improvement project was developed using the Plan-Do-Study-Act cycle advocated by the American Board of Radiology.

RC402 (Educational Course)

Strategies for Developing Business Leadership Skills in the Midst of Healthcare Reform Challenges

Tuesday, Dec. 1, 4:30-6:00 p.m.

Room S404CD

AS HEALTHCARE DELIVERY systems undergo rapid and dramatic changes, the need for dynamic physician leadership in both academic and private practice settings continues to increase. But traditional graduate medical education curriculum often leaves young radiologists ill-equipped to address complex issues related to practice management, health policy and economics. Presenters will introduce such educational opportunities at the resident, fellow and practicing radiologist level and share the early experience of several academic and private medical centers in these pursuits.

RC616 (Educational Course)

Tweet This: How to Make Radiology More Patient Centered (Sponsored by the RSNA Public Information Committee)

Thursday, Dec. 3, 8:30 a.m.-10:00 a.m.

Room S403A

IN THE ERA of consumer-driven healthcare, patient portals, online health resources and social media, radiolo-

gists must provide personal and patient-friendly services and use a variety of means to connect with patients. In this course, presenters will provide specific examples and strategies for harnessing the power of the Internet and social media to become more patient centered.

RC502 (Educational Course)

What's New from the American Board of Radiology (ABR)

Wednesday, Dec. 2, 8:30-10:00 a.m.

Room S104A

MODERATED BY ABR President Milton J. Guiberteau, M.D., the sessions provide updates on various issues related to ABR:

- Making MOC Work
- The Board Eligible Radiologist: Hiring Perspectives and Concerns
- ABR Certifying Exams in Diagnostic Radiology
- The Alphabet Soup of MOC, CC and SA-CME
- Interventional Radiology (IR)/Diagnostic Radiology (DR) Certificate and IR Residency

See Thursday's Daily Bulletin for a full report on the session, "What's New from the American Board of Radiology."

VI162-ED-X (Education Exhibit)

Interventional Management of Hemoptysis: For Every Interventional Radiology Resident/Fellow

All Day—Vascular & Interventional (VI) Community, Learning Center

INTerventional PROCEDURES are considered to be an effective nonsurgical treatment and play an important role in the management of hemoptysis. This education exhibit offers a comprehensive review of diagnostic imaging and a therapeutic strategy and interventional techniques for management of hemoptysis.

OB119-ED-X (Education Exhibit)

PET-CT and MRI of Gynecological Tumors for Every Radiology Resident/Fellow: Imaging Techniques, Understanding Image Findings and Role in Management

All Day—Obstetrics & Gynecology (OB) Community, Learning Center

ATTEENDEES WILL LEARN to recognize the uptake pattern of FDG in PET-CT and MRI techniques; to know the optimal planning for therapy of uterine cancer and ovarian cancer on PET-CT and MRI; and to gain knowledge through questions and answers on clinical situations in gynecological imaging.

Residents Eat, Mix, Mingle at RSNA/ACR Reception

At a reception hosted by RSNA and the American College of Radiology (ACR) on Monday, residents from around the world had a chance to eat, mix and mingle with their peers and network with longtime RSNA members and radiology leaders.



RSNA 2015 Honorary Members



Honorary Membership is presented for significant achievements in the field of radiology. On Monday RSNA President Ronald L. Arenson, M.D., presented the 2015 Honorary Memberships. Pictured (left to right): Lorenzo Bonomo, M.D., of Rome, Chamaree Chuapetcharasopon, M.D., of Bangkok, Dr. Arenson and Jung-Gi Im, M.D., of Seoul.

How to Claim Credit at RSNA 2015

Access Credit Eval Center by clicking My Agenda from Meeting Central (Meeting.RSNA.org). Credit Eval provides easy access to evaluate RSNA 2015 courses and to claim credits online using your own laptop or mobile device. Attendees can also access Credit Eval at Internet Kiosks located throughout McCormick Place.

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

Future of Imaging Interoperability Key to Improved Patient Care

CONTINUED FROM COVER

the purpose to advance interoperability in the U.S., include specifications, best practices, and policies, as well as testing and interoperability.

"Interoperability is a journey, not a destination," she said. "It took the financial services industry 20 years to do it, but the U.S. government thinks it can happen for healthcare in three."

Since 2007, The Sequoia Project has operated the eHealth Exchange, facilitating the sharing of health information. That knowledge will assist in Sequoia's new partnership with RSNA for the Image Share Validation Program.

The Image Share Validation Program was created for vendors of Reporting Systems, Radiological Information System (RIS) and PACS that wish to enable those systems to connect to networks for sharing images with providers and patients, or vendors of health information exchange systems that wish to enhance their systems to exchange medical images and reports.

Starting with a pilot testing program in 2016, RSNA will conduct validation testing of commercial systems for image sharing capabilities based on IHE profiles with the support of the Mallinckrodt Institute of Radiology at Washington University, St. Louis, and The Sequoia Project. Vendors who successfully pass the



David Mendelson, M.D. announces Image Share Validation Program.

testing program will be awarded the right to use the RSNA Image Share Validation mark to convey to purchasers that their products have achieved compliance with the capabilities tested in the program.

For the initial pilot program, RSNA will offer validation of four bundles of functionality, based on IHE profiles and actors. These include XDS-I (cross-enterprise document sharing) Document Source and Consumer, XDS-I Registry and Repository, XCA-I (cross-community access for imaging) Gateway and Patient-focused Image Sharing through a personal health record (PHR) system. Test participants can choose to be tested for any combination of bundles.

For more information, visit the *IHE Image Sharing Demonstration site in South Building, Hall A, Booth 1345.*

Do You Image Wisely? **EVERY** year?

Be sure to visit:

RadiologyInfo.org Booth, RSNA Services
ACR Booth 2960, South Hall A
ASRT Booth 1911, South Hall A
AAPM Booth 1109, South Hall A



New in 2016

Your pledge to Image Wisely® will expire Dec. 31, 2016 — and every Dec. 31 thereafter.

Yes, this is new in 2016. Your pledge is now going to be an annual renewal. To image wisely every day, it's important to keep informed by visiting the information on **imagewisely.org** — including radiation safety cases* — and making the annual commitment.

Not yet pledged? Stop by one of our booths at RSNA 2015 and pick up your pledge ribbon.

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imagewisely.org



*Approved for AMA PRA Category 1 Credits™, Category A Credit and CAMPEP

Expanding the Definition of Innovation is Key to Growth in Healthcare

CONTINUED FROM COVER

"In this area, you're seeing a lot of technologies being developed," he said. "We're just scratching the surface of the kinds of productivity tools we can bring from a monitoring standpoint and do it all in a mobile setting with clinical value."

The challenge in the industry has been the notion that a radiologist in one setting can develop everything that is necessary to learn about a patient or group of patients and capitalize on the benefits of modern technology.

"The machines are amazing – the power of the CT scanner, the power of an MR," Immelt said. "But the machines are always going to be more powerful than any one clinician can be."

To that end, GE began working on the GE Health Cloud, which was unveiled Sunday at RSNA 2015. It allows radiologists to study and share images or to do new protocols on images without geographic limitations.

"We think this is another advancement that is both clinically important and adds to productivity around the world," Immelt said.

He also said achieving clinical outcomes, improving patient satisfaction, lowering lifecycle cost and driving strategic growth will be key to radiology's future.

"We're going to be working on this the rest of our lives in terms of how to improve healthcare outcomes, costs and quality," he said. "Everyone who is in the healthcare industry today has to learn how to grow and take cost out at the same time. They have to learn how to produce great patient outcomes, and do so productively. And that is never going to go away."

Special Recognition for In-Kind Support

RSNA would like to recognize the following companies for contributing equipment to the Educational Courses at RSNA 2015:

Bayer HealthCare	Vital, A Toshiba
Bracco	Medical Sys-
CareFusion*	tems Group
DFINE	Company
Laurane Medical	

*Companies not exhibiting

TODAY'S PRESS CONFERENCES

RSNA invites members of the medical news media to attend its annual meeting each year in order to help the public gain a greater understanding of radiology and its role in personal healthcare. Research developments presented at the meeting are shared with the public through print, broadcast and internet media stories.

Four press conferences will be held today:

- Gastric Artery Embolization Shows Promise in Treating Obesity
- Ultrasound Reveals Knuckle-Cracking Fireworks
- Researchers Use Gaming Technology to Create Better X-Rays
- MRI Reveals Heart Changes During Apnea in Elite Divers

RSNA 2015 press releases are available at RSNA.org/press15.

New Horizons Lecture Dedicated to Jolesz

The New Horizons Lecture presented yesterday is dedicated to the memory of Ferenc A. Jolesz, M.D., whose innovative work in image-guided therapy distinguished him as a leader in radiology worldwide.

HIS GROUNDBREAKING research contributed to the establishment by the National Institutes of Health of the National Center for Image-Guided Therapy at Brigham and Women's Hospital (BWH), Boston. Dr. Jolesz was honored as the 2002 RSNA Outstanding Researcher.

Dr. Jolesz served as director of the MRI division and the image-guided therapy program at BWH and was the driving force behind the first intra-operative MRI and the advanced multimodality image-guided operating (AMIGO)

suite. The AMIGO suite integrates multiple imaging modalities with advanced navigational technologies in a single operating suite. Dr. Jolesz and his colleagues also introduced the first MRI-guided, focused ultrasound (MRgFUS) surgical procedure, which was successfully applied to the treatment of solid neoplasms.

Born in Budapest, Hungary, Dr. Jolesz earned his medical degree from Semmelweis Medical School and completed a residency in neurosurgery at the Institute of Neurosurgery in Budapest. He traveled to the U.S. in 1979 to begin a fellowship

in neurology at Massachusetts General Hospital and the Boston Biomedical Research Institute, followed by a research fellowship in physiology at Harvard Medical School. He joined the faculty at BWH in the radiology department in 1985.

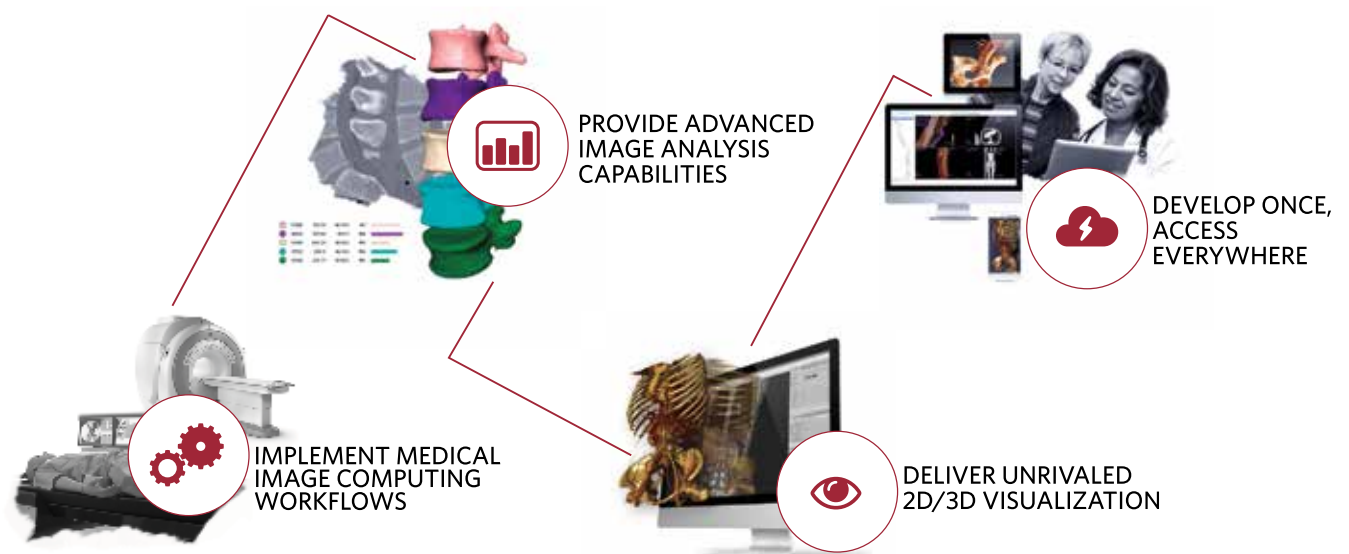
Dr. Jolesz died December 31, 2014, at 68.



Ferenc A. Jolesz, M.D.

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Attend our daily presentations and learn how the Open Inventor toolkit can help your software development team implement your medical image computing workflow — including the integration of advanced image processing and analysis capabilities, high-end 2D and 3D visualization, and the implementation of interactive display and manipulation of distant 2D/3D data on desktop or mobile devices.

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Music May Help Blind Children Develop Other Skills, fMRI Study Shows

By Elizabeth Gardner

CLASSICAL MUSIC TRAINING COULD help blind children develop skills in areas where they have deficits due to their blindness, according to a functional MRI (fMRI) study presented Monday.

Samples of classical music stimulated the brains of children blind from birth in distinctive ways compared with the brains of sighted controls, and in some cases stimulated areas not normally associated with hearing, said Pilar Dies-Suarez, M.D., chief radiologist at the Hospital Infantil de México Federico Gómez in Mexico City. Both groups process random noise similarly.

“Musical stimulation is very cheap and easy to give to children, so it's important for every child to receive musical education, but it's even more important if they have some kind of disability because it could help them with other skills,” she added. For example, the musical sounds activated areas associated with vision that are not normally stimulated in blind children, and she speculated that such stimulation might help them develop better equilibrium.

In the session, “Functional MRI in Blind Children with Auditive Stimulus” researchers assessed differences in brain recruitment and connectivity when passages of classical music were compared with random non-melodic noise in a control and blind pediatric population. The study tested 10 blind children and 15 sighted controls, ranging from 5 to 6 years old.

Both groups showed significantly more brain activity in response to the music stimulus than to the random noise. Blind children showed right-hemisphere predominance in the study, while the sighted control group showed left-hemisphere predominance. The cerebellum played a major role in sound interpretation for both groups. Music activated the frontal lobe in both groups, while temporal activations were found for both types

of stimuli. Specifically, the Wernicke's area was involved for both groups and both types of stimuli, which Dr. Dies-Suarez said was unexpected.

Two sequences were run: a T1-weighted gradient echo sequence using 35 axial slices that covered the whole brain of pediatric volunteers including their cerebellum, and an fMRI-BOLD sequence. Data was acquired with a T2 gradient echo sequence. A total of 255 volumes per fMRI-BOLD experiment were acquired. Every stimulation protocol started with a white noise period that was not considered for image analysis later on.

The study was limited to classical music, though Dr. Dies-Suarez said she thinks it would be interesting to try similar studies with other genres of music, such as jazz, hip-hop and rock.

The research team is planning a follow-up study to assess the effect of musical training—instrumental lessons and regular listening sessions—on the brain activity and development of both groups. Dr. Dies-Suarez seeks participation from at least 10 children from each group, who will receive a year of training in a controlled classroom setting.

Recruitment among the group of blind children is proving somewhat complicated, since the parents of the children will need to transport them regularly to music class, but she hopes to present the results of the follow-up study at a subsequent RSNA meeting.

“Musical stimulation is very cheap and easy to give to children, so it's important for every child to receive musical education, but it's even more important if they have some kind of disability because it could help them with other skills.”

Pilar Dies-Suarez, M.D.



Pilar Dies-Suarez, M.D.

Aromatherapy, Breathing Techniques, Aid MRI Anxiety

By Mike Bassett

WHILE THE MEDICAL BENEFITS of MRI are not disputed, getting an MRI examination can be a stressful experience for some patients, particularly those who suffer from anxiety issues such as claustrophobia.

But according to a study presented Monday, the use of complementary alternative medicine (CAM) strategies involving aromatherapy and breathing techniques can help reduce MRI anxiety related to claustrophobia.

“Anxiety and claustrophobia is a global issue for patients, technologists, and businesses alike,” said presenter Selena Glenn, M.A., B.S.R.T., an MRI technologist at Rebound Orthopedics

and Neurosurgery in Portland, Ore. “Its effects include delayed treatment, patient fears, frustration for technologists and financial losses.”

“Anytime a patient can't finish an exam, that person can't get a diagnosis as quickly as needed,” she said. “And when a patient can't get on that table, that slot becomes a loss. And with changes in health-care and medical reimbursement reductions, it has become even more important to keep patients on the table.”

And getting patients on the table and keeping them there hasn't been easy. According to Glenn, there were 2 million canceled MRI examinations worldwide in 2011, representing \$1.35 billion in losses.

“Although there have been many interventions introduced to ease patient anxieties, technologists still experience problems and more interventions are needed,” she said.

Glenn happened upon the idea of using complementary alternative medicine strategies from her own experience dealing with nicotine withdrawal. “Aromatherapy was most effective in helping deal with nicotine withdrawal symptoms,” she said. “And I also found that breathing techniques were important in taking care of panic issues.”

Aromatherapy is the practice of using materials and aromatic oils from plants to enhance a person's physical or psychological wellbeing.

Because Glenn is often responsible for dealing with claustrophobic patients at her practice, she decided to focus on those patients for her RSNA 2015 research. In the study, 38 claustrophobic patients were divided into four arms—two experimental and two control groups.

The experimental groups included patients who used anxiety medicine and those who were non-medicated; the same criteria were used for the control groups. Aromatherapy and breathing techniques were performed by the experimental groups just before entering the scanner bore, while the control group was provided standard care and sham aromatherapy.

The study design included the collection and analysis of quantitative, physiological, and qualitative data. According to Glenn, both experimental groups demonstrated a 76.5 percent reduction in anxiety levels from the pre-exam period to the post-complementary alternative medicine treatment stage. The control groups, on the other

hand, experienced statistically insignificant drops in their anxiety levels.

When asked to name the most effective tool for helping reduce anxiety, patients in the experimental group said 56 percent mentioned aromatherapy and breathing techniques together as opposed to 39 percent who cited breathing techniques alone and 5 percent who named aromatherapy alone.

“Aromatherapy and breathing techniques reduce MRI anxiety,” she concluded, adding that it can help reduce the number of cancelled exams and operational costs, and gives technologists another intervention.

“But most importantly it keeps the patients on the table so they can get their exams done the first time around and without treatment delays,” she said. “And this technique is very versatile—you can adopt in any MRI department in the world.”



Selena Glenn, M.A., B.S.R.T.

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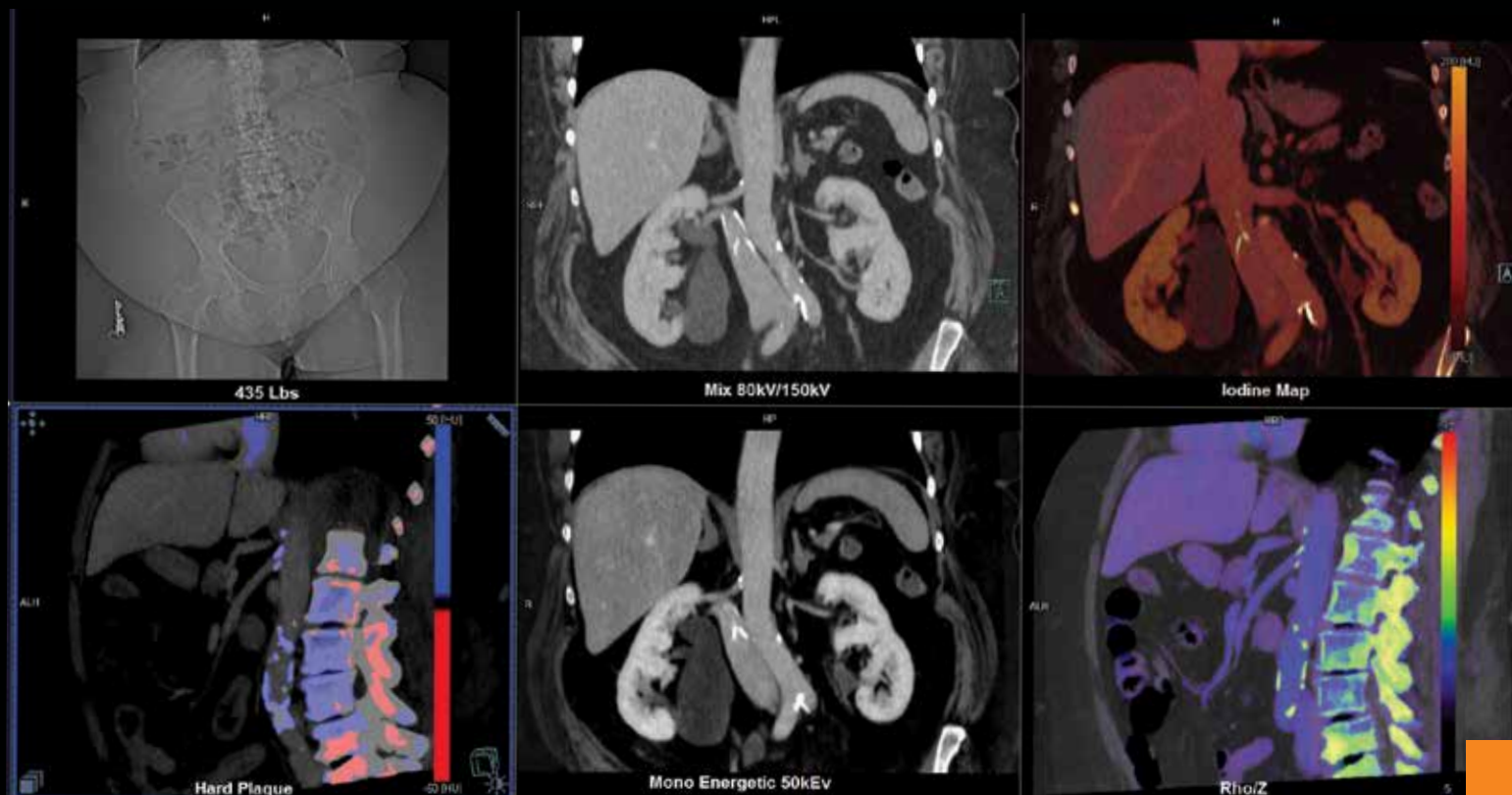
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¹Pandharipande PV, Reisner AT, Binder WD, et al. CT in the Emergency Department: A Real-Time Study of Changes in Physician Decision Making. Radiology. 2015;Sep 24:150473. [Epub ahead of print]

Radiology Editor Urges Authors to Use Checklists to Improve Reporting Accuracy

Radiologists can publish more effective research and will more readily get published if they follow standard checklists of essential information to include in studies, said presenters at a Monday session.

By Ed Bannon

THE PRESENTERS reviewed a toolbox of checklists that researchers should follow to ensure they include key information in their studies to show that their conclusions are reproducible and generalizable.

"The goal of the course is not to be alarmist but rather to help attendees understand the importance of these checklists and how they can be used to improve the quality of the reporting of studies submitted to our journal," said Herbert Y. Kressel, M.D., editor of *Radiology* and professor of radiology at Harvard Medical School. "The major focus has been on reproducibility of results."

Dr. Kressel provided examples. In working with original authors, the pharmaceutical company Amgen, could only reproduce results on five of 53 key studies, he said. And in another review of studies, Bayer Healthcare could only reproduce results in 25 percent of 63 studies, he said.

To address similar problems in radiology research such as bias and applying an inappropriate analysis method, presenters offered an overview of various checklists, including Standards for Reporting Diagnostic Accuracy Studies, or STARD, and Preferred Reporting Items for Systematic Reviews and Meta-Analyses, or PRISMA. The session focused on STARD and PRISMA because they were developed for the most common types of studies that RSNA publishes.

STARD is a checklist for reporting studies on the accuracy of a diagnostic procedure. It outlines the standard sections for a study and includes a checklist of more than 30 required items such as an index test, participants' eligibility criteria and where the full study protocol can be accessed.

It's better to consult, PRISMA, an evidence-based minimum set of items for reporting in systematic reviews and meta-analyses, if a researcher is conducting a systematic review of research or a meta-analysis, said presenter Matt McInnes, M.D., of the University of Ottawa.

The PRISMA checklist suggests including such items as presenting a full electronic search strategy for at least one database; discussing methods used for assessing risk of bias of individual studies; and discussing limitations at study and outcome level and at review level.

Other guides include CONSORT, a checklist for reporting randomized controlled trials, and STROBE, a checklist for reporting observational studies.



Herbert Y. Kressel, M.D.

Although the checklists might seem burdensome, researchers should view them as tools to ensure the research is done correctly, said presenter Patrick Bossuyt, M.D., a clinical epidemiologist from the University of Amsterdam who helped draft the first STARD checklist 15 years ago. "Publishing quality research is about increasing value, reducing waste and disseminating more information," he said.

Senior *Radiology* Editor Deborah Levine, M.D., agreed, saying that raising the standard of publishing is good for the researchers. "Our goal is to help you build and optimize your research study and have the most clinical impact," she said.

Dr. Kressel noted that the NIH is increasingly requiring funding candidates to follow these standards and that *Radiology* will begin to require that all diagnostic accuracy studies follow STARD guidelines starting in January.

The details of all of these guides are in the EQUATOR network website, www.equator-network.org, which includes a tool to help researchers determine which reporting checklist is best for their research.

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Annual Oration in Diagnostic Radiology Presented Today

THREE CATEGORIES OF Innovation will shape the future of radiology: imaging technologies, infrastructure and information/communications systems, and the application of the imaging correlates of precision medicine, according to James H. Thrall, M.D., who will present today's Annual Oration in Diagnostic Radiology, "Trends and Developments Shaping the Future of Radiology."

On the horizon, X-ray based imaging will reduce radiation exposure to the point that dose will no longer be a topic of concern or controversy, and phase contrast imaging with X-rays—which has the potential to reduce radiation doses by 10- to 100-fold or more—is likely to be the next entirely new imaging method in clinical practice. Data will drive development of better appropriateness criteria, which will be immediately available to ordering providers and their patients, Dr. Thrall says. And radiology will play a critical role in precision medicine by establishing links between patient genotype and imaging phenotypes for surveillance of disease manifestation, assessment of disease extent and discovery of genetic polymorphisms.

But the future holds challenges for the specialty as well. New developments will lead to vastly increased complexity in radiology practice with associated increased educational requirements, especially in parametric imaging. And radiology will face an unrelenting competition for "ownership" of imaging methods between specialties in clinical practice and in research, Dr. Thrall says.

Dr. Thrall is Chairman Emeritus of the Department of Radiology at Massachusetts General Hospital, Boston. Dr. Thrall served as Chairman of the Department of Radiology at Massachusetts General Hospital from 1988 until 2013 while holding the Juan M. Taveras Professorship of Radiology at Harvard Medical School.



James H. Thrall, M.D.

Medical Physics

Answer

[Question on page 6A.]

A SAR (specific absorption ratio) is the ratio of radiofrequency power to mass. The International Electrotechnical Commission standard states that a SAR greater than 4 W/kg be used only for research, and as much must be approved by an Institutional Review Board.

Q&A courtesy of AAPM.

Margulis Award Presented for Alzheimer's Research

The RSNA Alexander R. Margulis Award for Scientific Excellence was presented Monday to Jeffrey W. Prescott, M.D., Ph.D., and colleagues for the article, "The Alzheimer Structural Connectome: Changes in Cortical Network Topology with Increased Amyloid Plaque Burden."

The award, named for Alexander R. Margulis, M.D., a distinguished investigator in the science of radiology, recognizes the best original scientific article published in a particular year in *Radiology*.

The article, published in the October 2014 issue of *Radiology*, describes the authors' investigation of the effects of Alzheimer's disease on the connectome of the central nervous system. Drawing on data from the Alzheimer's Disease Neuroimaging Initiative (ADNI), the study evaluated differences in the connectome among patients with normal cognition, mild cognitive impairment and Alzheimer's disease, and also determined a connection between the connectome and cortical amyloid deposition.

Study authors evaluated both florbetapir PET and diffusion weighted imaging at baseline, using diffusion tensor imaging data to generate connectome data and florbetapir PET to assess localized amyloid deposition. They found that increased cortical florbetapir signal was associated with decreases in weighted structural connectome metrics, and conclude that large-scale structural network changes can be detected even in the preclinical stages of Alzheimer's disease.

That analysis holds substantial promise for trials of Alzheimer's disease therapies. Specifically, biomarker information—including the integrity

of the connectome—might be studied to reduce development times for new drugs, diminish costs associated with clinical trials, improve drug safety and optimize drug efficacy.

The Margulis Award Nominating Committee and the Margulis Award Selection Committee review published manuscripts based on their novelty, quality, importance and potential scientific and clinical impacts. Committee members were impressed with the use of the international cohort of patients, the novelty of the analysis and the potential importance of the findings with respect to future therapy for Alzheimer's disease.



RSNA president Ronald L. Arenson, M.D., left, presents Jeffrey W. Prescott, M.D., Ph.D., with the RSNA Alexander R. Margulis Award for Scientific Excellence.

Catheter-directed Thrombolysis Helps Patients with Deep Vein Thrombosis

By Richard S. Dargan

ADDITIONAL TREATMENT WITH catheter-directed thrombolysis (CDT) is effective in certain patients with deep vein thrombosis (DVT), according to results of a study presented Monday.

In DVT, a clot, or thrombus, forms in the deep veins, typically in the legs. About one in four DVT patients develop post-thrombotic syndrome (PTS), in which the clots cause inflammation, block blood flow and damage the tiny vein valves that allow blood to flow against gravity from the legs back to the heart. When valves are damaged and fail to close properly, the flow reverses—a phenomenon known as venous reflux. As PTS worsens, poor blood flow in the leg can cause leg ulcers, which can be difficult to treat.

The current standard of care for post-thrombotic syndrome includes anticoagulation drugs, compression stockings and surgical treatment of superficial insuffi-

cient veins. Severe PTS with ulcers and/or pain caused by too little blood flow may require more invasive procedures, such as venous bypass, placement of stents to keep the vessels open and the creation of new valves, or neo-valves, from the vein's inner wall.

These treatments have significant shortcomings, according to study co-author Ole Grotta, M.D., from the University of Oslo in Norway. Stockings and surgical treatment of superficial veins may not provide sufficient relief of symptoms, and in treatments for severe PTS, stents can become blocked and neo-valves may prove insufficient.

Another treatment option is CDT, where a catheter is used to deliver clot-busting drugs to the site of the thrombus.

For the study, researchers examined



Ole Grotta, M.D.

whether the addition of CDT to conventional therapy had a persistent benefit in reducing PTS, and if CDT increased the unobstructed area of the vessel and reduced reflux five years following DVT. The 209 patients were drawn from the Norway-based CaVenT Study, the first randomized controlled trial to evaluate the effect of additional CDT.

Patients with DVT were randomized to receive conventional therapy alone or additional CDT. PTS was assessed and the venous system was examined by duplex ultrasound and air plethysmography, a technique that measures circulatory capacity, to analyze blood flow and look for evidence of reflux.

The results revealed significant benefits for patients who received CDT, and the effect was sustained and increased from two to five years post-treatment.

"In the intervention group who received additional CDT, the percentage of patients with PTS at five years was 42.5 percent, compared to 70.8 percent in

the control group," Dr. Grotta said. "We suggest CDT be considered in patients with extensive DVT and a low risk of bleeding."

The findings support the open vein hypothesis, a theory that rapid thrombus elimination and restoration of unobstructed deep venous flow may prevent reflux, venous obstruction, and PTS, according to Dr. Grotta.

Dr. Grotta noted that two ongoing studies will provide more knowledge about the effect of CDT in patients with DVT. The U.S.-based Acute Venous Thrombosis: Thrombus Removal with Adjunctive Catheter-Directed Thrombolysis (ATTRACT) trial is looking at CDT's effectiveness in reducing the occurrence of PTS over a 24-month follow-up period. The Catheter Versus Anticoagulation (CAVA) Trial is a Dutch multicenter trial comparing ultrasound-accelerated CDT and standard anticoagulant therapy with standard anticoagulant therapy alone in acute DVT.

Radiology Workload Outpacing Reimbursement, Study Shows

Radiologists can employ strategies such as advocacy and adding value to combat a reimbursement imbalance that has emerged over the past decade, said a radiologist who presented an analysis on reimbursement trends at a Monday session.

By Ed Bannon

WHILE RADIOLOGISTS' workloads increased by 43 percent between 2001-2013, their Medicare reimbursements have only increased by 24 percent, according to the analysis of Nationwide Medicare Part B databases conducted by Manisha Patel, M.D., of Thomas Jefferson University in Pennsylvania.

"There is a clear imbalance," Dr. Patel said. "Radiologists' workloads grew considerably faster than their reimbursements over the entire study period, while in the downturn of the last few years, they saw a considerably greater drop in reimbursements than in workload."

The study crunched the numbers from the nationwide Medicare Part B databases for 2001-2013, examining Current Procedure Terminology (CPT) codes for all noninvasive diagnostic imaging by radiologists. By assigning a total professional component (PC) relative value unit



Manisha Patel, M.D.

(RVU) to each code each year and calculating RVU rates per 1,000 Medicare beneficiaries, PC RVU rates were generated as a proxy for workload and cost. Total Medicare payments to radiologists were also drawn from the database.

The study found that the RVU rate per 1,000 Medicare beneficiaries increased by 43 percent from 2001-2013—to 2,218 in 2013 from 1,548 in 2001. The rate

peaked at 2,404 in 2009, representing a 55 percent increase over 2001 levels.

Meanwhile, total Medicare payments to radiologists have not kept pace. Reimbursement levels have risen by only 24 percent from 2001-2013—to \$4.2 billion in 2013 from \$3.4 billion in 2001. Reimbursements actually outpaced productivity until 2006—peaking that year at \$5.3 billion—but by 2013, reimbursement had fallen 20 percent.

The Deficit Reduction Act passed in 2005 caused the drop in reimbursement rates and the Patient Protection and Afford-

able Care Act, commonly known as Obamacare, has limited cost increases since it passed in 2010, Dr. Patel said.

The reduction in Medicare reimbursements could be creating a negative feedback loop that accelerates the imbalance, Dr. Patel said. A reduction in professional fees likely pressured radiologists to try to increase their revenue by increasing productivity. Thus, radiologists must interpret more studies within a given time period.

"This is concerning, as overworked radiologists could miss important diagnoses leading to malpractice suits," Dr. Patel said.

Reducing Reimbursement Cuts

There a number of strategies radiologists can employ to help reduce reimbursement cuts, Dr. Patel said. These include maintaining representation in the Relative Value Scale Update Committee (RUC) to ensure that payments to radiologists are appropriate and advocating for the Center for Medicare & Medicaid Services (CMS) to forgo further reimbursement cuts.

Also, Dr. Patel said, "Given the shift from a fee-for-service to a fee-for-value reimbursement model, it is important for radiologists to add value to the profession and expand their repertoire of services through noninterpretive work." For example, she suggested joining hospital committees to build relationships with administrators, doing more consulting with referring physicians as well as patients, and screening requests for imaging exams to ensure they are necessary. To further expand their practice, radiologists could also supervise advanced imaging exams.

Dr. Patel predicted negative consequences if reimbursements continue to decline.

"Radiologists may find it financially difficult to care for Medicare patients and be forced to reduce services," she said. "There may be inappropriate emphasis on increasing efficiency rather than providing higher quality care. Radiology may be increasingly viewed as a commodity."

RSNA 2015 Gold Medalists

RSNA's highest honor—the Gold Medal—will be awarded to three individuals during today's plenary session

Hedvig Hricak, M.D., Ph.D., Dr. hc, is internationally renowned for her extensive research and clinical expertise in genitourinary and gynecologic oncologic imaging. Her pioneering work in MRI and MR spectroscopic imaging of prostate cancer and MRI and CT of gynecological cancers helped lay the groundwork for genitourinary and gynecologic oncologic imaging as we know them today. Dr. Hricak was the President of RSNA in 2010.

Dr. Hricak, a native of Zagreb, Croatia, earned a medical degree from the University of Zagreb, in 1970. She came to the U.S. two years later, completing her radiology residency at St. Joseph Mercy Hospital in Pontiac, Mich., in 1977, followed by a fellowship at Henry Ford Hospital in Detroit, where she served as a senior staff member.

She served from 1982 to 1999 as professor of radiology, radiation oncology and gynecology and, eventually, as head of abdominal imaging in the Department of Radiology at the University of California, San Francisco. In 1999, she assumed her current position as Chair of the Department of Radiology, Carroll and Milton Petrie Chair, Memorial Sloan-Kettering Cancer Center, New York. Dr. Hricak received her Ph.D. (Dr. Med Sc) from the Karolinska Institute in Stockholm, Sweden, in 1992, and in 2005 became the first woman to receive an honorary doctorate in medicine (Dr. hc) from the Ludwig Maximilian University of Munich in its 500-year history.

Dr. Hricak was appointed to the RSNA Board of Directors in 2002 as liaison for

publications and communications. Prior to her Board appointment, Dr. Hricak served as chair of RSNA's Public Information Advisory Board and as a member of other RSNA Public Information Committees. As Chair of the RSNA Board of Directors, Dr. Hricak was a driving force behind major rebranding efforts and advocated for international outreach.

One of the most highly respected educators in radiology today, **Robert A. Novelline, M.D.**, has become virtually synonymous with the words "emergency radiology." Along with establishing one of the nation's first emergency radiology residency/fellowship programs in the early 1980s, Dr. Novelline, a professor of radiology at Massachusetts General Hospital (MGH) and Harvard Medical School, Boston, has trained hundreds of students and junior staff members and is a founding member of the American Society of Emergency Radiology (ASER).

Born in Boston, Dr. Novelline received his medical degree from Boston University School of Medicine and completed his radiology residency and fellowships in both vascular/interventional radiology and radiology education at MGH. Much of Dr. Novelline's early research and many of his publications dealt with therapeutic intravascular infusion therapy, therapeutic embolization and angioplasty.

Dr. Novelline's dedication to radiology education began early in his career. He served as director of both the Harvard Medical School Core Clerkship and the Advanced Radiology Clerkship at MGH



Hedvig Hricak, M.D., Ph.D., Dr. hc



Robert A. Novelline, M.D.



Steven E. Seltzer, M.D.

between 1975 and 2012. In 1977, Dr. Novelline was named assistant professor of radiology at MGH and Harvard Medical School, moving up the ranks to his current position as professor in 1996. In 1982, he was appointed director of the newly formed Division of Emergency Radiology at MGH—a position he held until 2012.

Among his extensive RSNA service, Dr. Novelline served as the first RSNA co-chair of the RSNA-ACR Public Information Website Committee, and oversaw the successful launch of *RadiologyInfo.org*, the first-of-its kind patient information portal. Dr. Novelline also served on the RSNA Refresher Course Committee from 1997 to 2006, serving as chairman from 2003 to 2006, and as director of the Emergency Radiology Track from 1997 to 2002.

A renowned clinician and researcher, **Steven E. Seltzer, M.D.**, has forged a legacy as a passionate educator committed to teaching and mentoring radiology students and junior faculty to fill the leadership roles so critical to the specialty's future.

Born in Philadelphia, Dr. Seltzer received his baccalaureate and medical degrees from the University of Pennsylvania and completed his radiology residency at the Peter Bent Brigham Hospital in

1980. He joined the Brigham and Women's Hospital/Harvard Medical School staff directly afterward, and remained on staff for his entire career.

Since 1997, Dr. Seltzer has held his current position as Chairman of the Department of Radiology at Brigham and Women's Hospital and the Philip H. Cook Professor of Radiology at Harvard Medical School.

From 1984 to 1997, Dr. Seltzer served as co-director of abdominal imaging and director of CT at Brigham and Women's Hospital, a role that allowed him to educate, mentor and facilitate the development of dozens of residents and fellows—many of whom went on to long-term careers as academic radiologists or funded researchers.

Dr. Seltzer, who served on the RSNA Health Policy and Practice Committee from 2000 to 2002, is active in numerous radiology organizations and served as president of the AUR, the Academy of Radiology Research (ARR) and the Society of Chairs of Academic Radiology Departments. Dr. Seltzer was elected to fellowship in the American College of Radiology in 1997. He was awarded the AUR gold medal in 2004.

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