

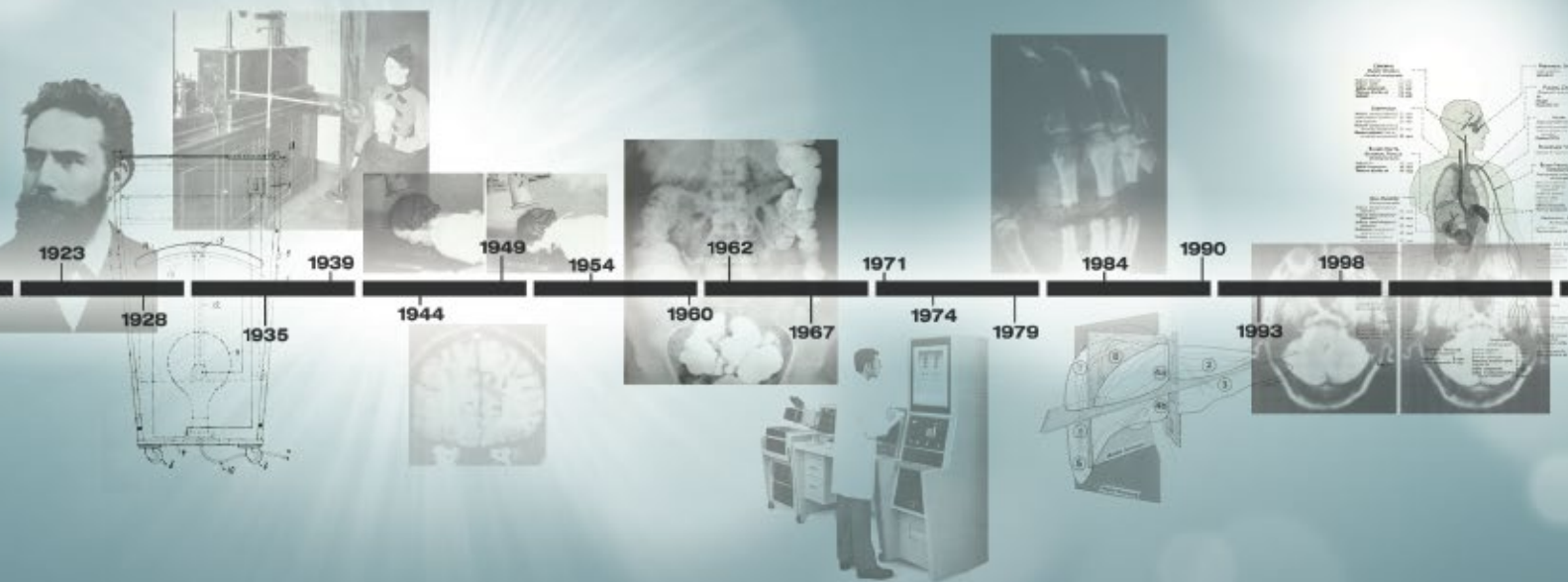
DTI Detects Muscle Changes in Long-Distance Runners

ALSO INSIDE:

The Future of Alternative Isotope Sources
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The Promise of Molecular Breast Imaging
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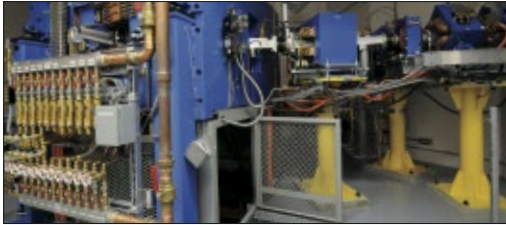


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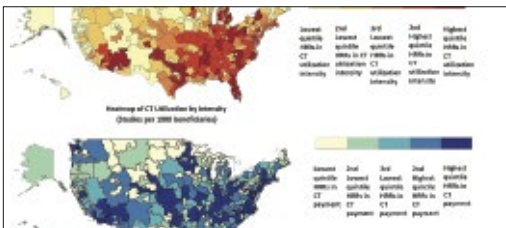
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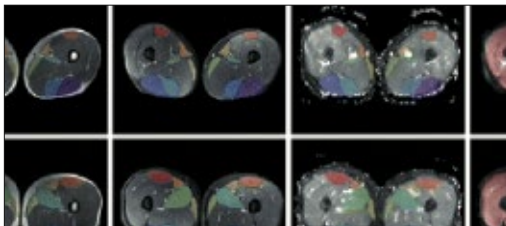
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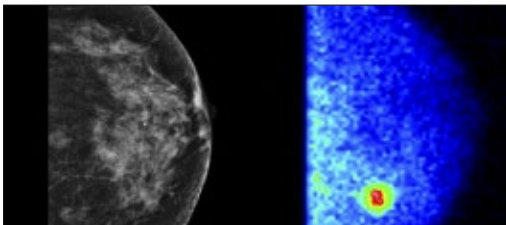
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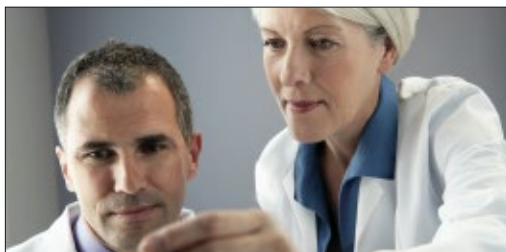
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Dunnick, Lim, Osborn honored by ESR

RSNA immediate past-president N. Reed Dunnick, M.D., Tae-Hwan Lim, M.D., Ph.D., and Anne G. Osborn, M.D., were named Honorary Members during the recent European Society of Radiology (ESR) annual meeting in Vienna, Austria.

Dr. Dunnick is the Fred Jenner Hodges Professor of Radiology and chair of the Department of Radiology at the University of Michigan Health System in Ann Arbor. Dr. Lim is professor of radiology at the University of Ulsan College of Medicine and a radiologist in the Asan Medical Center's Department of Radiology in Seoul, Korea.

The first recipient of the RSNA Outstanding Educator Award in 2000, Dr. Osborn is a Distinguished Professor of Radiology at the University of Utah School of Medicine in Salt Lake City. She also holds the William H. and Patricia W. Child Presidential Chair in Radiology at the University of Utah.



RSNA assisted members and supported its European constituency by sending staff to the European Society of Radiology's (ESR) European Congress of Radiology (ECR) held in March in Vienna. 2014 RSNA President N. Reed Dunnick, M.D., (center) was awarded ESR Honorary Membership during the congress, by Bernd K. Hamm III, M.D., ESR 2nd vice-president (right) and Lorenzo Bonomo, M.D., ESR President (left).

Calandra Receives Chicago Radiological Society's Gold Medal

The Chicago Radiological Society (CRS) honored **Joseph D. Calandra, M.D.**, with the Distinguished Service Award, at its recent annual meeting. The award is the Society's highest honor. Dr. Calandra, chair of the Department of Radiology at Presence St. Francis Hospital in Evanston, Ill., was recognized for his outstanding leadership in organized medicine and community relations along with his many years of dedicated service to radiology.



Calandra

CORRECTION



The In Memoriam obituary in the May 2015 issue of *RSNA News* incorrectly stated the institution affiliation for Deborah MacAdam Forrester, M.D. Dr. Forrester spent her entire career in the Department of Radiology at the University of Southern California Keck School of Medicine in Los Angeles.

Numbers in the News

124

Number, in millions, of unique diagnostic imaging services examined by researchers checking for a correlation between imaging use and geographic region. Learn how researchers envision using their data for targeted interventions to reduce overuse of imaging while improving imaging quality, on [Page 7](#)

75

Number, in thousands, of imaging procedures per day in which Technetium-99m (Tc-99m) is a key component. Turn to [Page 5](#) to learn how researchers are developing alternatives to nuclear reactors to secure a reliable supply of the world's most highly used medical isotope.

93

Number of clinicians referring imaging tests to the Department of Radiology at New York University (NYU) Langone Medical Center, who were surveyed for their impressions of the department. The survey resulted in significant quality improvements, as well as greater collaboration between radiologists and clinicians, say NYU personnel. Learn more on [Page 13](#).

363

Percentage increase in the invasive cancer detection rate when molecular breast imaging was added to mammography, according to the recently published results of a study at the Mayo Clinic. Turn to [Page 11](#) to learn how these findings, along with results of earlier studies, prompted Mayo to make supplemental imaging with MBI its standard of care for women with dense breasts.

RSNA 2015 PLENARY LECTURERS

The RSNA Board of Directors has announced the distinguished individuals who will deliver honored lectures at the 101st Scientific Assembly and Annual Meeting.



Kirch



Immelt



Thrall



Curran

SPECIAL LECTURE

Darrell G. Kirch, M.D.
President and CEO,
Association of American Medical Colleges
Washington, D.C.

NEW HORIZONS LECTURE

Jeffrey R. Immelt
Chairman and CEO, GE
Fairfield, Conn.

ANNUAL ORATION IN DIAGNOSTIC RADIOLOGY

James H. Thrall, M.D.
Boston

ANNUAL ORATION IN RADIATION ONCOLOGY

Walter J. Curran Jr., M.D.
Atlanta

AAPM Symposium Lecturers Announced

The RSNA Board of Directors has named the lecturers who will present during the American Association of Physicists in Medicine (AAPM) Symposium at RSNA 2015. They are **Bruce R. Rosen, M.D., Ph.D.**, of Charlestown, Mass., and **Jonathan E. McConathy, M.D., Ph.D.**, of St. Louis.



Rosen



McConathy

RSNA Group Billing Benefits Practices, Academic Institutions

Renewing memberships for the 20 RSNA members working at X-Ray Associates of New Mexico, Santa Fe, was a challenge for office administrative assistant Michelle Davis. Until the practice enrolled in RSNA's group billing option, that is.

Since making the switch three years ago, Davis sends in only one invoice during each membership renewal cycle. The option is available to any practice or academic institution with large numbers of RSNA members.

"Rather than paying individually for 20 people, it's much more efficient on both of our ends to just pay one bill. It's very simple and organized. I get an email list, I indicate additions or deletions, e-mail it right back, get the correct invoice, pay with a credit card one time only and it's done for the next year," Davis said.

Bibi Husain, fellowship coordinator in the radiology department of the University of Minnesota, Minneapolis, also says group billing made her life easier since she no longer has to wait for all RSNA members in her department to submit invoices. And it benefits the doctors too.

"It makes it easier for the radiologists who don't have to worry when it's time for registration dues. Group billing helps it all go smoothly. It's one less thing to worry about for the doctors and for me."

To set up this option, contact the RSNA Membership Department at membership@rsna.org or 1-877-776-2636 (630-571-7873 outside the U.S. and Canada).



Radiology Leaders Praise Repeal of SGR Policy

After a decade of temporary fixes, radiology leaders are applauding the U.S. Senate's April decision to permanently repeal the flawed Sustainable Growth Rate (SGR) formula that determines Medicare physician payment rates.

New legislation approved by Congress provides for an annual 0.5 percent physician payment update starting in July 2015 through 2019, and creates incentives for physicians to transition to value-based alternative payment models. President Barack Obama signed the bill into law.

Radiologists have long criticized the SGR formula that typically calculated large physician reimbursement cuts into the formula. Since 2003, Congress has avoided such cuts through a series of "patches," that failed to permanently fix the formula and left physicians in a state of flux. The Senate's April 14 vote staved off a proposed 21 percent reduction in Medicare payments to physicians, which would have gone into effect on April 15.

Radiology leaders are lauding the bill as a huge step forward from the previous decade of stop-gap "fixes."



Rao

"This is welcome news for all physicians," said Vijay M. Rao, M.D., RSNA Board Liaison for Information Technology and Annual Meeting. "We can't just provide a clinical support tool and expect it to work like a charm," said Dr. Rao, the David C. Levin Professor and chair of Radiology at Jefferson Medical College of Thomas Jefferson University. "This also calls for a sense of urgency for radiologists to embrace change, prepare for rapid transition to value-based practice, and focus on quality and performance measures."

While the ICD-10 code set implementation had previously been delayed by a clause in the SGR bill, no mention of ICD-10 was made in the new bill. The deadline for the ICD-10 transition is expected to remain October 2015.

A full report on the SGR appeal will appear in the July issue of *RSNA News*; the August issue will feature a report on radiology's transition to ICD-10.



Lee

Matsumoto named SIR President; Lee, Fuchs Earn JVIR Editor's Best Awards

The *Journal of Vascular and Interventional Radiology* (JVIR)—the Society of Interventional Radiology's (SIR) peer-reviewed scientific journal—presented the 2014 JVIR Editor's Best awards to Shin Jae Lee, M.D., and Katrin Fuchs, Pharm.D., during the SIR annual meeting recently in Atlanta, Georgia.

Dr. Lee, of Severance Hospital, Seoul, Korea, was honored for the outstanding clinical research paper "Comparison of the efficacy of covered versus uncovered metallic stents in treating inoperable malignant common bile duct obstruction: A randomized trial."

Dr. Fuchs, of the University of Geneva, Switzerland, accepted the award for outstanding laboratory investigation for "Drug-eluting beads loaded with anti-angiogenic agents for chemoembolization: In vitro sunitinib loading, release and in vivo pharmacokinetics in an animal model."

Alan H. Matsumoto, M.D., an interventional radiologist and professor and chair of the Department of Radiology and Medical Imaging at the University of Virginia, Charlottesville, assumed the office of SIR president. Dr. Matsumoto has served the RSNA Annual Assembly Faculty in multiple roles, including refresher course faculty and multisession faculty.

SIR bestowed **Lindsay Machan, M.D.**, and **Kieran J. Murphy, M.D.**, with the Leaders in Innovation Award. Dr. Machan is an interventional radiologist at Vancouver Hospital, British Columbia; Dr. Murphy is an interventional radiologist at the University of Toronto. **Sharon Kwan, M.D.**, received the Dr. Gary J. Becker Young Investigator Award.



Fuchs



Matsumoto

RSNA SPEAKERS AT CIR BODY CT COURSE ANNOUNCED

RSNA worked with the Interamerican College of Radiology (CIR) to present a symposium on body CT at the CIR course in Cancun this month. Speakers who will represent RSNA are:

- **Ricardo C. Cury, M.D.**
Radiology Associates of South Florida
- **Michael P. Federle, M.D.**
Stanford University
- **Rendon C. Nelson, M.D.**
Duke University Medical Center
- **Cynthia S. Santillan, M.D.**
University of California, San Diego

RSNA Board of Directors Report

At meetings in January and March, the RSNA Board of Directors updated RSNA's strategic plan, continued planning for RSNA 2015 and appointed volunteers to various Society committees.

Strategic Plan

A refreshed RSNA Strategic Plan for 2015-2020 was approved. The new plan can be found at RSNA.org/RSNA_Strategic_Plan.aspx.

RSNA Diagnosis Live™

Radiology residency programs are reminded that complimentary licenses are available for them to use RSNA Diagnosis Live™, an interactive learning tool which gives attendees of a lecture or class the opportunity to “play along” by answering questions using their personal mobile wireless devices. For information, interested programs should contact Betsy Lockett at blockett@rsna.org.



Richard L. Ehman, M.D.
Chairman, 2015 RSNA
Board of Directors

Volunteers Represent, Support RSNA

The Board made appointments to RSNA's Education Exhibits Awards Committee, Scientific Program Committee, and committees overseeing RSNA publications as well as RSNA members to represent the Society in other radiology and medical societies.

Radiology Lends Its Perspective to Connectivity Efforts

RSNA is participating in national discussions hosted by the Office of the National Coordinator for Health Information Technology (ONCHIT) regarding the establishment of a nationwide roadmap for interoperability in healthcare information.

International Collaborations

RSNA is pleased to provide financial support to the Deutsche Röntgensgesellschaft for its efforts to restore the birthplace of

Wilhelm Roentgen in Lennep, Germany. Learn more about the restoration project at www.roentgen-geburtshaus.de.

The Board also authorized funding of three scholarships at \$3,000 each annually for the Inter-American College of Radiology's Latin American School of Radiology.

Image Wisely® Initiative Matures

The Board received recommendations from a workgroup studying the future of Image Wisely®, an initiative founded in 2010 by RSNA and the American College of Radiology, American Association of Physicists in Medicine and American Society of Radiologic Technologists to raise awareness in the medical community to choose the best

imaging exam for a particular clinical indication and optimize the imaging technique to provide diagnostic images using the lowest radiation dose possible. The recommendations will now be considered by the Image Wisely executive committee in charting the future of the initiative.

The Celebration Continues at RSNA 2015

Plans continue for RSNA 2015, where the Society will mark the 100th anniversary of its founding with an updated Centennial Showcase and more. Go to RSNA.org/AnnualMeeting for the latest on RSNA 2015.

RICHARD L. EHMEN, M.D.

Chair, 2015 RSNA
Board of Directors

THIS MONTH IN THE RSNA NEWS ONLINE VERSION

Get more of this month's news online at RSNA.org/News. Enjoy interactive features including video, audio, slide presentations and more. Go online to leave us a comment and easily share stories via social media as well.

This month's story on the development of a new generation of medical isotope sources—a key component in many imaging procedures—features a video on the production of technetium-99m (Tc-99m) in a cyclotron at Centre de recherche du Centre hospitalier universitaire de Sherbrooke, Quebec. Our story on advances in molecular breast imaging features a video interview with Mayo Clinic researcher Michael O'Connor, Ph.D.



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New Generation of Medical Isotope Sources Being Developed

BY MIKE BASSETT

In 2009 nuclear medicine got a glimpse of the future when Canada's National Research Universal reactor in Chalk River, Ontario, which produces a major share of the world's supply of medical radioisotopes, shut down for repairs.

THE SHUTDOWN OCCURRED at the same time as another of the world's major isotope-producing reactors, the High Flux Reactor in Petten, the Netherlands, which closed for a month-long maintenance inspection. The result was a medical isotope shortage that reached crisis levels.

Technetium-99m (Tc-99m) is the world's most highly used medical isotope and a key component in more than 75,000 imaging procedures a day. Chalk River and several other reactors like the one in Petten have been producing large quantities of Molybdenum-99 (Mo-99), which undergoes radioactive decay to form Tc-99m within special generators that are shipped to and stored in local hospitals on a weekly basis for use in nuclear medicine procedures.

While that isotope shortage crisis subsided in 2010 when Chalk River came back online, it became clear that new alternatives to nuclear reactors were needed to secure a reliable supply of medical isotopes, particularly with the planned permanent shutdown of Chalk River (originally scheduled for 2016, now 2018—see sidebar).

An Alternative to Reactors Emerges

One of the most promising alternatives is the use of cyclotrons to produce Tc-99m. The concept actually dates to 1971, when J.E. Beaver and H.B. Hupf published "Production of 99m Tc on a Medical Cyclotron: A Feasibility Study," said Paul Schaffer,

Researchers confirmed the capability of producing technetium using already installed medical cyclotrons and performed nuclear medicine imaging procedures confirming the bioequivalence in small animals.

The technology works by using the cyclotron to irradiate pure, non-radioactive Molybdenum-100 with a proton beam, thereby transforming it into Tc-99m.

In 2010, the Canadian government announced a \$35 million Non-reactor-based Isotope Supply Contribution Program (NISP) to promote research into alternative methods for producing medical isotopes. Projects led by TRIUMF/the BC Cancer Agency and ACSI/Université de Sherbrooke/University of Alberta consortiums investigated different methods of Tc-99m production, while the Canadian Light Source and the Prairie Isotope Production Enterprise investigated Mo-99 production by linear accelerators.

In 2013, the Canadian government implemented the \$25 million, four-year Isotope Technology Acceleration Program (ITAP) to further advance cyclotron and linear accelerator technologies for Tc-99m production. Grants for cyclotron projects were awarded at the University of Alberta and TRIUMF.

In early 2015, TRIUMF announced that researchers had demonstrated that the technology can work on a number of different cyclotrons capable of servicing fairly large population centers.

"We demonstrated on three different types of cyclotrons," Dr. Schaffer said. "One was the General Electric PETtrace880, which has the world's largest install base with more than 350 units all over the world. We demonstrated a sufficient quantity of production to service a population of 1 million."

Dr. Schaffer added that TRIUMF has also demonstrated that TR-19 series cyclotrons manufactured by ACSI could produce a sufficient amount of isotope for a population of 2.5 million people. "Theoretically, a TR-30 cyclotron—a more powerful version of the TR-19—could produce enough Tc-99m for a population of 4.5 million people," he said.



Schaffer

Image courtesy of TRIUMF

"Theoretically, a TR-30 cyclotron—a more powerful version of the TR-19—could produce enough Tc-99m for a population of 4.5 million people."

PAUL SCHAFFER, PH.D.

Ph.D., an assistant professor of radiology at the University of British Columbia (UBC) and the head of nuclear medicine at TRIUMF, Canada's national laboratory for particle and nuclear physics in Vancouver, B.C.

"But the concept was never tested on a large scale and there were formidable technical challenges to overcome," Dr. Schaffer said. In addition, the fact that nuclear reactors could efficiently produce Molybdenum-99 (Mo-99) meant there was little incentive to investigate other approaches to the commercial-scale production of Tc-99m.

But circumstances have now changed.

During the 2009 isotope shortage, researchers at the Centre de recherche du centre hospitalier universitaire de Sherbrooke (CRCHUS), Quebec, produced Tc-99m using a TR-19 cyclotron manufactured by Advanced Cyclotron Systems, Inc. (ACSI).



In early 2015, researchers at the Centre de recherche du centre hospitalier universitaire de Sherbrooke, Quebec, (above), demonstrated that the Tc-99m produced by a cyclotron is equivalent to that produced by a nuclear reactor. The news of a possible alternative is encouraging in light of the shortage of Tc-99m, the most highly used medical isotope and a key component in more than 75,000 imaging procedures a day.

Images courtesy of the Centre de recherche du Centre hospitalier universitaires de Sherbrooke.

"Our next step," Dr. Schaffer said, "is finishing trials, hopefully by the fall of 2015," followed by full market approval and commercialization by 2016.

Clinical Trials on Cyclotron-Produced Tc-99m Underway

In early 2015, researchers at CRCHUS completed a clinical trial in which they demonstrated that the Tc-99m produced by a cyclotron is equivalent to that produced by a nuclear reactor.

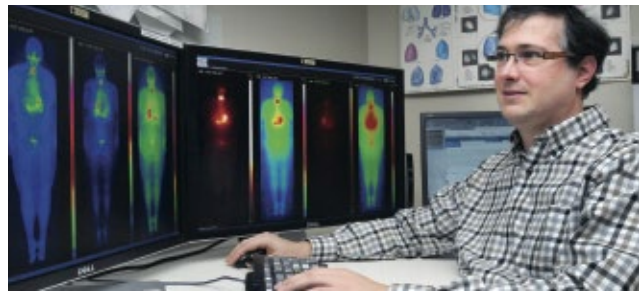
Éric E. Turcotte, M.D., a researcher at CRCHUS and professor in the Université de Sherbrooke's Faculty of Medicine and Health Sciences, and colleagues studied patients undergoing thyroid scans, including 11 patients using the cyclotron-produced agent compared to 22 matched patients scanned with Tc-99m obtained by a nuclear reactor.

"The thyroid scan is one of the only investigations in nuclear medicine that uses raw technetium," Dr. Turcotte said. "We scanned for thyroid cancer, hyperthyroidism, Graves' disease and other diseases of the thyroid gland. We demonstrated that the images produced with Tc-99m from a cyclotron were the same as those with Tc-99m from the nuclear reactor. The same biodistribution, with no side effects and the same image quality."

Dr. Turcotte and his colleagues now want to use cyclotron-produced Tc-99m for more complicated nuclear medicine tests, such as assessing myocardial contractility, perfusion-ventilation studies in investigating pulmonary embolism, bone scans and myocardial perfusion imaging.

As to whether cyclotrons can adequately replace a reactor like Chalk River to produce Tc-99m, "It's all about power," Dr. Schaffer said. "Chalk River is a high-powered reactor and produces a lot of isotopes. A single cyclotron is not going to replace Chalk River. The idea is that you can decentralize with a number of machines and build up capacity that way."

"In principle you can get to that stage, but I don't believe that's going to happen immediately," Dr. Schaffer added. "Nor does the world have the number of cyclotrons needed to accomplish a complete switchover from Chalk River to cyclotrons. But eventually this process can be a substantial contributor to replacing Chalk River."



Éric E. Turcotte, M.D., (above), a researcher at Centre de recherche du centre hospitalier universitaire de Sherbrooke, and colleagues plan to continue their research on cyclotron-produced Tc-99m for more complicated nuclear medicine tests.

Dr. Turcotte agreed, noting that one nuclear reactor can produce millions of doses of technetium a year. "You're talking about something that is producing on a worldwide scale," he said. Cyclotrons, however, could be useful for producing the isotope on a smaller local or regional scale, he said.

"We expect the cyclotron at Sherbrooke to produce between 800 and 1,000 doses [of Tc-99m] a day," Dr. Turcotte said. "That amount would go a long way towards providing for the needs of Quebec when Chalk River shuts down in 2018."

Challenges Remain to Implementing Idea in U.S.

While potentially effective in Canada, the use of cyclotrons to deal with future medical isotope shortages in the U.S. faces some obstacles. The U.S. population is more spread out, for example, meaning that many Americans may not have access to hospitals and research centers with cyclotrons.

That said, Dr. Schaffer noted that TRIUMF has been working with American stakeholders to ramp up interest in the technology and said operators of fleets of cyclotron in the U.S. could potentially upgrade them in order to produce Tc-99m. □

MIKE BASSETT is a writer based in Holliston, Mass., specializing in health and medicine.

Chalk River Reactor Extends Operations to 2018

In 2010, the government of Canada announced its intention to stop producing Mo-99 at the National Research Reactor at Chalk River in 2016, with the idea of phasing out production over the course of six years.

Earlier this year, the government decided to extend operations at the reactor until March 31, 2018. The idea behind the extension, said Greg Rickford, Canada's Minister of Natural Resources, was to help support global medical isotope demand in case of unexpected shortages.

"Our support for this extension demonstrates our ongoing commitment to a responsible transition of our laboratories that supports global medical isotope supply," Rickford said.

Regional Factors May Impact Imaging Patterns

BY ED BANNON

Two recent studies showing a correlation between imaging use—including overuse—and geographic region could lead to more targeted reforms to reduce overuse of imaging and improve imaging quality and overall patient care, as opposed to “one-size-fits all” interventions.

IN A STUDY PUBLISHED online in February 2015 in the journal of *Radiology*, researchers from Brigham and Women’s Hospital, Boston, used a newly available public database from the Centers for Medicare and Medicaid Services to examine geographic variation in providers’ use of CT and MR, after adjusting for imaging referral across hospital referral regions (HRRs). Beneficiary and service counts, provider charges, Medicare-allowed amounts and payments, place of service, provider type and Medicare participation indicator were included. Researchers examined 124 million unique diagnostic imaging services (totaling \$5.6 billion in Medicare payments) performed for 34 million Medicare beneficiaries across 306 HRRs.

“In our research, we drilled down to each imaging study at the provider level, making the data more transparent and accessible,” said lead researcher Ivan Ip, M.D., M.P.H., an internist at Brigham and Women’s.

Dr. Ip and colleagues examined procedures per capita in each HRR and also developed an imaging referral index (IRI) to account for patients who crossed region boundaries. Researchers also measured utilization *intensity*, which they defined as the number of examinations per 1,000 beneficiaries.

For CT, the average unadjusted utilization intensity ranged from 226.8 per 1,000 beneficiaries in the lowest geographic area to 792.1 studies per 1,000 beneficiaries in the highest geographic area. After adjusting for IRI, the utilization intensity range narrowed from 330.4 studies per 1,000 beneficiaries in the lowest area to 684 per 1,000 beneficiaries in the highest.

For MRI, the average unadjusted utilization intensity ranged from 75.6 studies per 1,000 Medicare beneficiaries in the lowest area to 286.6 per 1,000 beneficiaries in the highest area; after

nia; Las Vegas; Washington, D.C.; New Brunswick, New Jersey; East Long Island, New York; and Phoenix.

The most common CT procedure in the two high-impact HRRs was head and/or brain CT; the most common MRI procedure in the 11 high-impact HRRs was lumbar spine MRI.

Identifying Variations, Not Causes, Was Study Goal

Rather than attempting to determine causes, researchers sought to simply shed light on variations in radiologic procedure patterns, Dr. Ip said. “One of the problems is that providers often do not know that they practice significantly differently from their colleagues next door. Our mission is to bring transparency to this issue.”

While previous studies have documented provider practice variations, this study delved further into the details, Dr. Ip said. “The more granular the data, the more actionable it is,” he said. “For example, saying, ‘We should decrease the number of CT scans’ is far different than saying, ‘We do more than double the CT pulmonary angiography in patients presenting with chest pain versus our comparison hospital.’”

Wide variations across HRRs in specific procedures may create an opportunity to focus on each clinical scenario, Dr. Ip said. As opposed to broad national campaigns, researchers suggest using more targeted interventions focusing on providers that order or perform the most common procedures in the highest impact regions as a way of realizing necessary change.

“We see an effective, targeted approach as a local provider-led initiative in which stakeholders are involved in the design, execution and monitoring of the process,” Dr. Ip said.

Study Shows Region-Level Association in Breast, Prostate Imaging

Another recent study demonstrated a correlation between inappropriate imaging by HRR region in breast cancer and prostate cancer patients.

Authors of the study published in the March 2015 issue of the *Journal of the American Medical Association (JAMA) Oncology* used American Society of Clinical Oncology standards to determine inappropriate imaging, garnering a broad sample from



Yu



Ip

“Providers often do not know that they practice significantly differently from their colleague next door. Our mission is to bring transparency to this issue.”

VAN IP, M.D., M.P.H.

adjustment, the intensity range narrowed from 105 studies per 1,000 beneficiaries in the lowest area to 256 per 1,000 beneficiaries in the highest area.

High-impact HRRs, those in the highest deciles for both adjusted intensity and payment, included two regions for CT: Jacksonville, Florida, and Baltimore. There were 11 high-impact HRRs for MRI: Fort Myers, Ft. Lauderdale, Orlando and Jacksonville, Florida; Dallas; Palm Springs–Rancho Mirage, Califor-

Researchers from Brigham and Women’s Hospital used a newly available public database from the Centers for Medicare and Medicaid Services to examine geographic variation in providers’ use of CT and MR, after adjusting for imaging referral across hospital referral regions (HRRs). High-impact HRRs (those in the highest deciles for both adjusted intensity and payment) included 11 for MR imaging (Fort Myers, Fort Lauderdale, Orlando and Jacksonville, Fla; Dallas; Palm Springs–Rancho Mirage, California; Las Vegas; Washington, D.C.; New Brunswick, New Jersey; East Long Island, New York; and Phoenix, *top right*); and two regions for CT (Jacksonville, Florida, and Baltimore; *bottom right*). (*Radiology* 2015; InPress) ©RSNA, 2015. All Rights Reserved. Printed with permission.

WEB EXTRAS

☑ Access the *Radiology* study, “Use of Public Data to Target Variation in Providers’ Use of CT and MR Imaging among Medicare Beneficiaries,” at RSNA.org/Radiology.

☑ Access the *JAMA* study, “Regional-Level Correlations in Inappropriate Imaging Rates for Prostate and Breast Cancers Potential Implications for the Choosing Wisely Campaign,” at jamanetwork.com.

the Surveillance, Epidemiology and End Results (SEER) Medicare-linked database.

Using Medicare data, researchers identified more than 9,000 men with low-risk prostate cancer and more than 30,000 women with low-risk breast cancer diagnosed

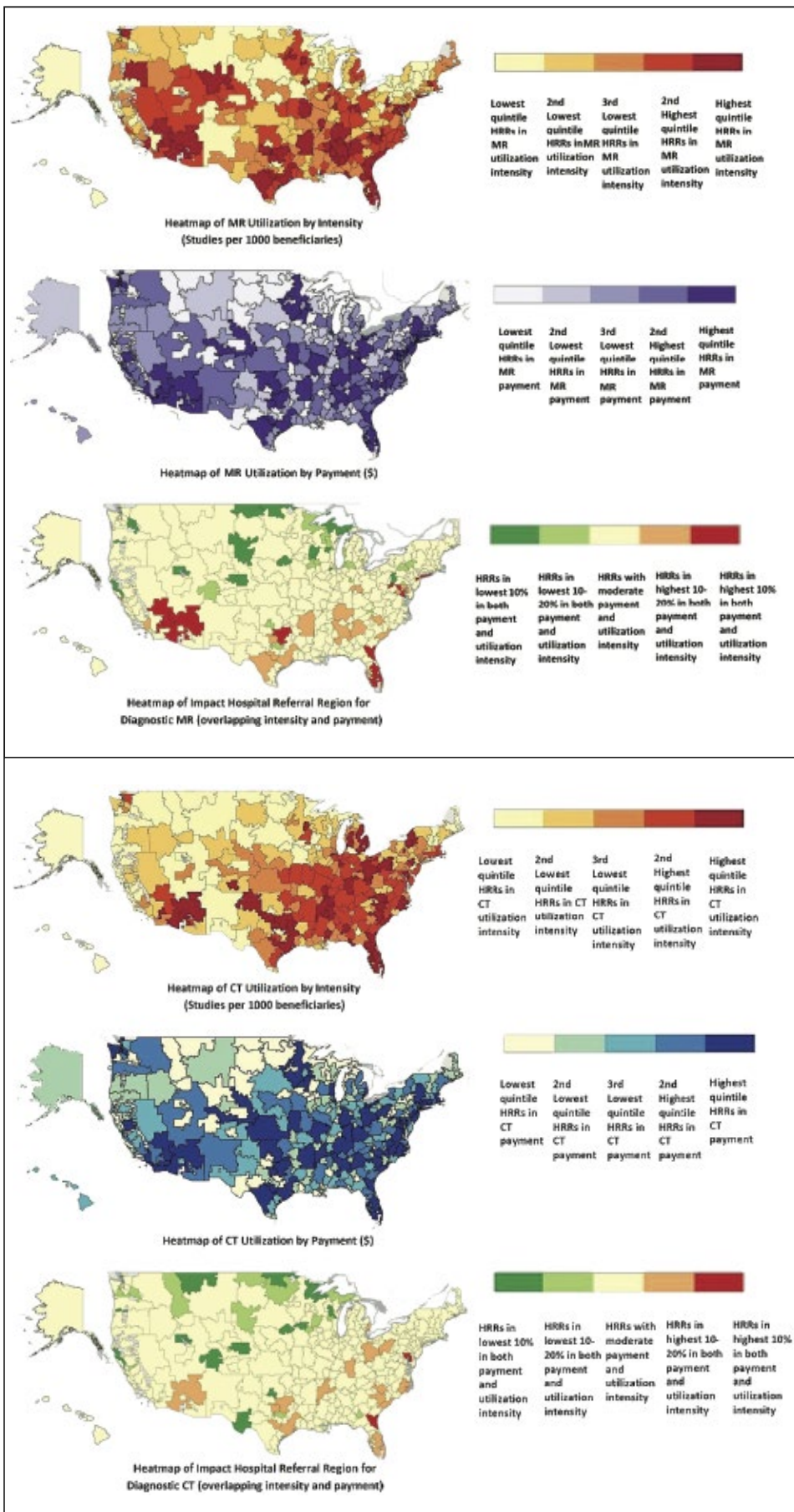
between 2004 and 2007, classified by region. Results showed high rates of inappropriate imaging for both: 44.4 percent for prostate cancer and 41.8 percent for breast cancer.

The study also demonstrated an association at the regional level in rates of inappropriate imaging of low-risk prostate cancer imaging and low-risk breast cancer imaging patients—suggesting that regional culture and infrastructure contribute to healthcare utilization patterns across diseases. These findings contrast with the Institute of Medicine position that individual-level decisions, rather than geography, drive regional healthcare spending variation.

Radiologists should use this data to reflect on potential biases within their region, said study author James B. Yu, M.D., M.H.S., a radiation oncologist at Yale University School of Medicine. “The regional variation likely has a lot to do with practice mix, relative pressures and entrenched patterns of care,” Dr. Yu said. “A lot of the way people approach medicine is local.”

Ultimately, understanding whether prostate and breast cancer imaging are associated at a regional level might promote more nuanced, regionally tailored interventions—such as educational initiatives—to improve population health and provide higher-value care, the authors said. Further research to determine the reasons for these regional patterns is necessary, Dr. Yu added. ☐

ED BANNON is a Chicago-based freelance writer.



Muscle Changes Detected with DTI after Long-Distance Running

BY PAUL LATOUR

Diffusion-tensor imaging (DTI) may help detect muscle changes over time that are not revealed by qualitative T2-weighted MR imaging with fat suppression, according to a recent study from the Netherlands.

THE RESEARCHERS DEVELOPED a method for obtaining DTI 3-D measurements of the upper leg—from hip to knee and fully including the hamstring and other frequently injured muscles—in a single imaging session. The study was published in the February 2015 issue of *Radiology*.

“Our method revealed subtle changes in DTI-derived parameters of muscle that occurred during marathon running, which were still measurable after three weeks,” said the study’s lead author Martijn Froeling, Ph.D., a postdoctorate student at University Medical Center Utrecht at Utrecht University in the Netherlands. “The elevated mean diffusivity, which was still present after three weeks, might be related to the natural disease course of fatigue-induced muscle disorders.”

Dr. Froeling and his colleagues performed a feasibility study with five male amateur long-distance runners who were evaluated one week before, two days after and three weeks after they participated in a marathon. The athletes underwent a 3-T MR examination of both upper legs at each time point. Data were acquired in three 40-section stacks with a five-section overlap by using a moving table approach without repositioning the coil. DTI data gave researchers the three tensor eigenvalues, the mean diffusivity and the decreased fractional anisotropy (FA).

Using T2-weighted images with fat suppression, a musculoskeletal radiologist graded signs of muscle injury. The injuries were graded as 0 (no abnormalities); 1 (mild swelling and edema with no discontinuities of the muscle tissue); 2 (partially ruptured muscle tissue); or 3 (complete disruption of the muscle tissue).

The radiologist also recorded the location, specific muscle, craniocaudal and axial length of the edema and/or hemorrhage.

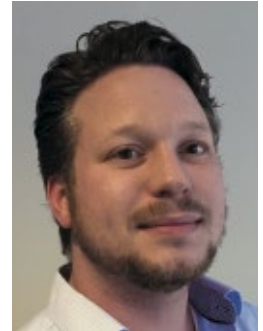
Six muscles in both upper legs were manually segmented based on the T1- and the T2-weighted images.

T2-weighted images revealed grade 1 muscle strains in nine of the 180 muscles investigated after the marathon. Two days after running, the biceps femoris muscle showed significant increases in all three diffusion eigenvalues and mean diffusivity. Mean diffusivity and two of the eigenvalues were significantly increased in the semitendinosus and the gracilis muscles when measured two days after the marathon.

“These findings might be related to a high risk for injury in biceps femoris and semitendinosus muscles during long-distance running,” Dr. Froeling said. He added that researchers could visualize the change of diffusion parameters by projecting them on the 3-D fiber tractography results.

DTI Could Be Relevant in Sports Injury Prognosis and Treatment

“The increase of mean diffusivity and decrease of FA after the marathon indicate that water diffusion is less restricted, which can be related to interstitial edema, cell swelling or the disruption

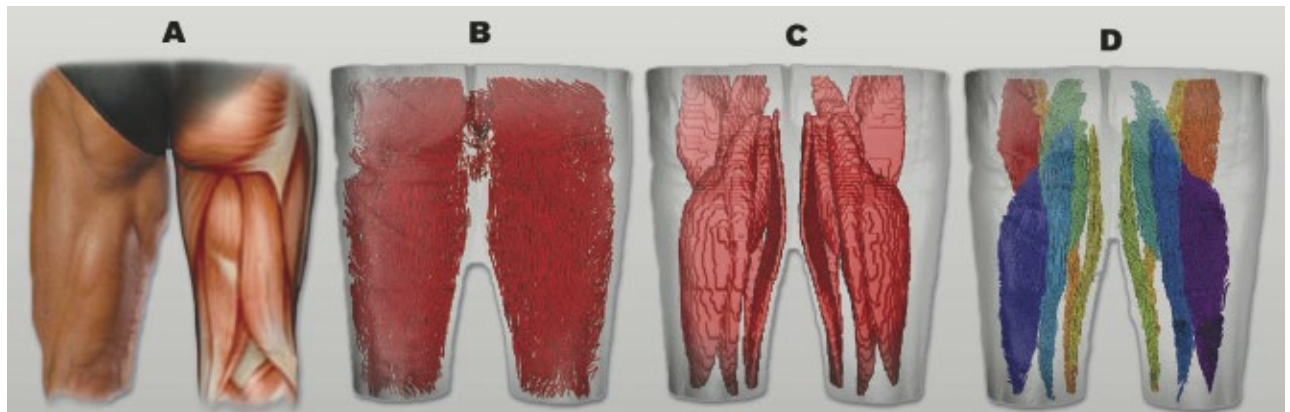


Froeling

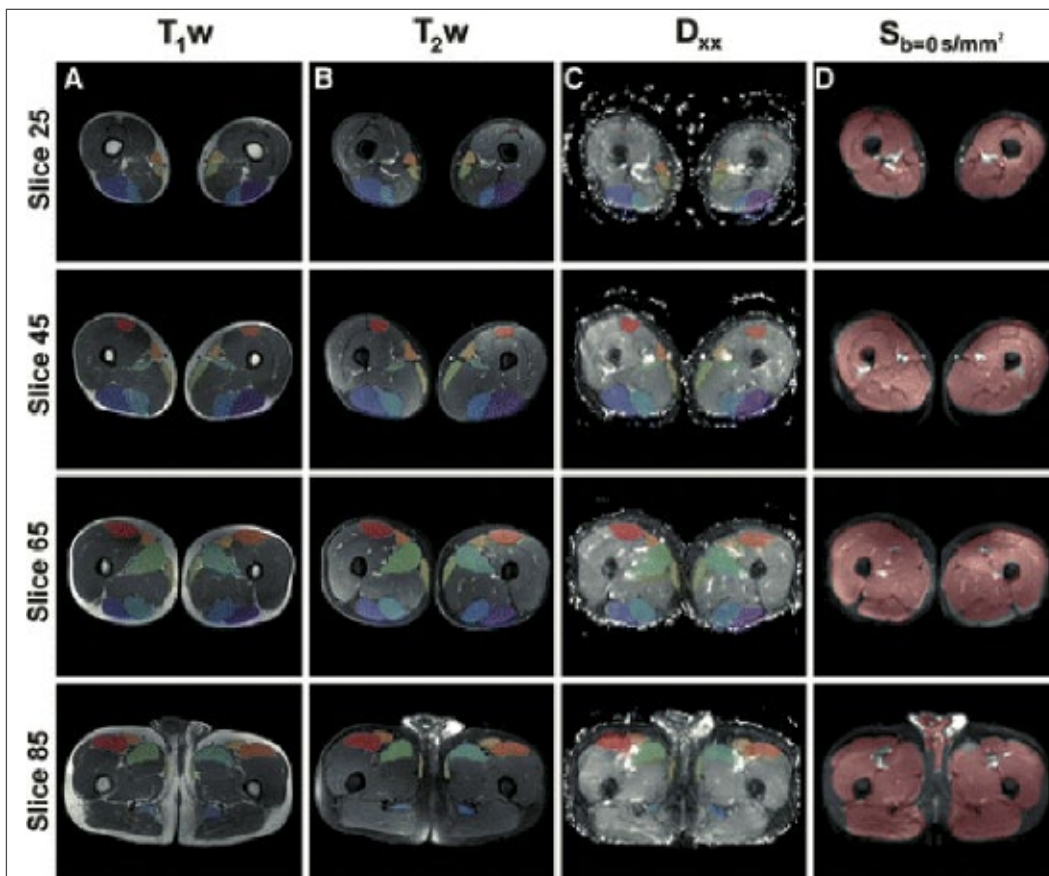


Nederveen

ON THE COVER



The posterior view of segmented muscles and fiber tractography. A) An illustration of upper leg muscles; B) whole-muscle volume fiber tractography; C) region-of-interest-based muscle segmentation; D) tractography of individual muscles. (*Radiology* 2015; 274:2;548-562) ©RSNA 2015. All rights reserved. Printed with permission.



DTI MR imaging may have diagnostic value in the evaluation of sports-related muscle injuries. *Left:* region-of-interest definition in four axial sections through the legs of one participant at time point A. **A)** T1-weighted images (turbo spin echo, 760/16) with colored regions of interest. **B)** T2-weighted images with fat suppression (turbo spin echo, 5500/70) with colored regions of interest. **C)** D_{xx} tensor component with colored regions of interest. **D)** Non-weighted diffusion image (spin-echo echo-planar imaging, 7500/36, $b = 0 \text{ sec/mm}^2$) with the entire muscle tissue volume colored. (*Radiology* 2015; 274-2:548-562). ©RSNA 2015 All rights reserved. Printed with permission.

of diffusivity barriers from muscle injury,” said Aart Nederveen, Ph.D., a medical physicist at the Academic Medical Center at the University of Amsterdam, the Netherlands, who supervised the project.

“The invisible damage may be the early part of the continuum of muscle damage related to injury,” Dr. Nederveen said. “We believe that DTI parameters will become diagnostically relevant for prognosis and treatment of sports-related muscle injury.”

The researchers also learned that the combination of muscle fiber tractography, diffusion parameters and anatomic MR imaging provides insight into physiologic changes in muscle up to three weeks after running.

“DTI may eventually allow for design of personalized rehabilitation programs,” Dr. Froeling said. “The method could be

especially useful in longitudinally evaluating athletes after muscle injury and could give a better prognosis when affected muscle function is restored.”

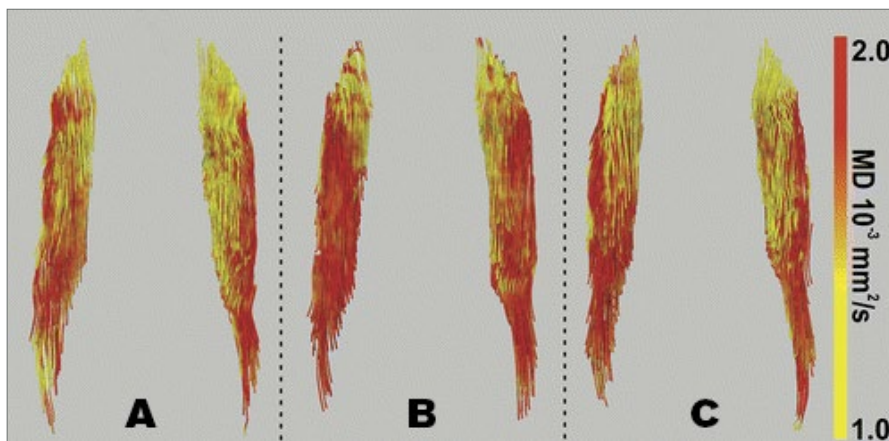
DTI protocol allowed investigators to evaluate subclinical muscle changes in the upper legs of long-distance runners that were otherwise not detectable on conventional T2-weighted MRI.

“DTI may even serve as an imaging biomarker in tailoring training; however, for DTI to become a routine clinical tool for assessment of muscle injuries, reference values and prospective studies are needed,” Dr. Nederveen said. □

PAUL LaTOUR is an RSNA News staff writer.

WEB EXTRAS

Access the *Radiology* study, “Muscle Changes Detected with Diffusion-Tensor Imaging after Long-Distance Running,” at [RSNA.org/doi/full/10.1148/radiol.14140702](https://doi.org/10.1148/radiol.14140702)



Fiber tractography of the biceps femoris muscle at time-points, A, B and C for participant 1. The fiber tracts are color coded for the mean diffusivity (MD). (*Radiology* 2015; 274-2:548-562). ©RSNA 2015 All rights reserved. Printed with permission.

Molecular Breast Imaging May Increase Cancer Detection for Women with Dense Breasts

BY RICHARD S. DARGAN

New research from Mayo Clinic demonstrates that using molecular breast imaging (MBI) as an adjunct to mammography results in an almost four-fold increase in invasive cancer detection in women with dense breast tissue. These findings, along with results of earlier studies, have spurred the Rochester, Minn., clinic to make supplemental imaging with MBI its standard of care for women with dense breasts.

IN THE STUDY, published in the February 2015 issue of the *American Journal of Roentgenology*, Mayo Clinic researchers assessed the diagnostic performance of supplemental screening MBI in 1,442 asymptomatic women with mammographically dense breast tissue. Currently, many physicians advise supplemental imaging be obtained for women with dense breasts—usually ultrasound or MRI—in order to avoid missing mammographically occult cancers, especially since women with dense breasts are also at a greater the risk of developing breast cancer.

The women in the study underwent mammography and MBI, a relatively new breast imaging technique pioneered by Michael O'Connor, Ph.D., a professor of medical physics in Mayo's Department of Radiology. MBI utilizes a small gamma camera to acquire images of the breast after injection of the radiotracer sestamibi.

"Breast tumors very avidly take up sestamibi," said Dr. O'Connor, who collaborated on the research with radiologists, surgeons and physicians at the Breast Diagnostic Clinic at Mayo Clinic in Minnesota. "With this technique, we're not looking at the architecture of the lesion, but rather its metabolic activity."

In the study group, 21 women were diagnosed with cancer, including two through mammography only, 14 by MBI alone, three by both mammography and MBI, and two by neither technique. Of the 14 women with cancers detected only by MBI, 11 had invasive disease. The addition of MBI to mammography increased the invasive cancer detection rate from 1.9 to 8.8 per 1,000 screens, a relative increase of 363 percent.

In the side-by-side comparison (See top right, Page 12), the screening mammogram was inter-



O'Connor



Berg

"Mammography and molecular breast imaging represent a very powerful combination moving forward."

MICHAEL
O'CONNOR, PH.D.

preted as negative; however, the MBI study clearly showed an area of focal uptake in a region where the breast tissue was dense. This corresponded to an 11 mm invasive ductal carcinoma.

"Our experience has shown that mammography doesn't always detect fairly significant cancers for some women due to breast density," Dr. O'Connor said. "These are the types of cancer that may eventually kill a woman."

MBI A Compelling Alternative to MRI, Ultrasound

Importantly, the effective radiation dose of MBI in the study was 2.4 milliSieverts (mSv)—which was significantly lower than levels reported in earlier Mayo studies, but still several times higher than the effective dose of the approximately 0.5mSv imparted by digital mammography.

"Over the last five years, we've worked to reduce dose in MBI to the point where the benefits appear to outweigh the risks," Dr. O'Connor said.

MBI is now a compelling alternative to ultrasound and MRI as a supplementary screening tool for women with dense breasts. With respect to ultrasound, MBI has a lower rate of recall for

additional testing. As compared to MRI, MBI is more easily tolerated by patients and only light compression is needed. For MBI, each of the four pictures takes only 5 to 10 minutes to acquire.

“Whenever we open a molecular breast imaging trial to enrollment, we get swamped because women know it’s a comfortable exam that works very well,” Dr. O’Connor said.

The findings have already changed Mayo Clinic’s breast imaging protocols. A specialty committee consisting of Mayo radiologists and physicians who work in breast disease recently decided that MBI would be the only supplemental technique offered to normal-risk women with dense breasts within the system.

Dr. O’Connor said the institution anticipates using MBI with either mammography or tomosynthesis for screening purposes. “Mammography and MBI represent a very powerful combination moving forward,” he said. “The most cost-effective approach may be alternating screening, with either mammography or tomosynthesis one year and MBI the next.”

Breast imaging expert Wendie Berg, M.D., Ph.D., professor of radiology at Magee-Womens Hospital of the University of Pittsburgh School of Medicine, said the findings show a potential role for MBI in screening the approximately 40 percent of women over age 40 who have dense breasts.

“The Mayo results show a very favorable supplemental cancer detection rate of 8 per 1,000 for dual-head molecular breast imaging in women with dense breasts who have had negative mammograms,” Dr. Berg said. “This rate is slightly less than has been observed using contrast-enhanced MRI, which averages a yield of 10 per 1,000 normal-risk women, but it is substantially more than ultrasound, which averages two-to-four additional cancers per 1,000 women screened depending on technique and who performs the examination.”

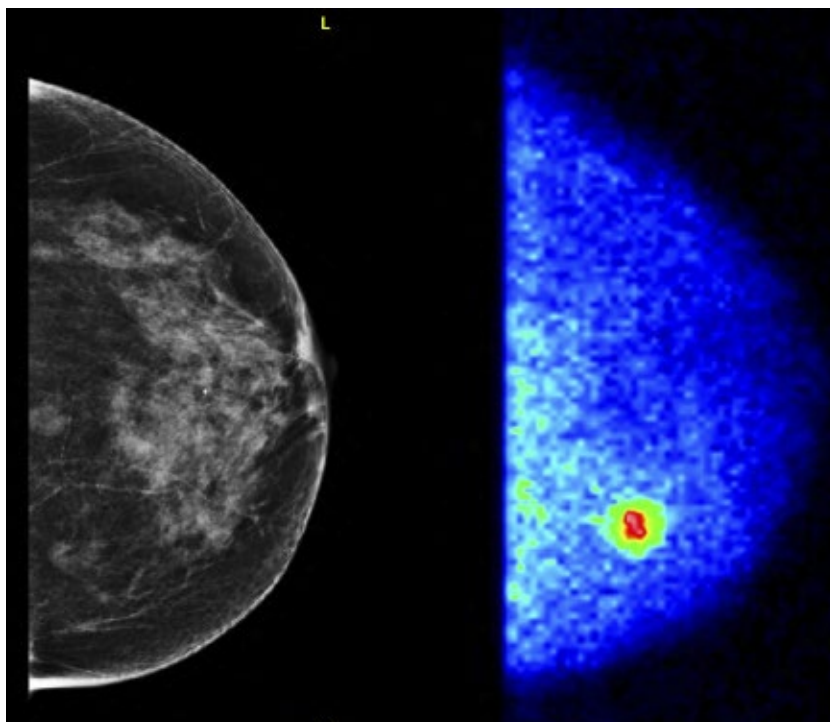
Dr. Berg cautioned, however, that MBI is not yet widely available and currently there is no method of direct MBI-guided biopsy for abnormalities seen only on MBI.

“At this time, results are only available for the first screening exam with MBI, and the vast majority of the work has been performed at Mayo,” Dr. Berg said. “It is important to validate these results at other centers, and we look forward to seeing results across the Mayo system as they implement MBI for screening women with dense breasts.”

Mayo Monitors MBI Performance

Dr. Berg, who recently launched an educational website (*Dense Breast-info.org*) focusing on breast density and supplemental screening, noted that tomosynthesis is another option for additional screening. When used with digital mammography, tomosynthesis lowers the chance of a recall for additional testing, she said.

MRI is recommended for annual screening in addition to mammography in women at high risk of breast cancer, such as those with a family history of BRCA gene mutations. If MRI is



A patient with negative mammogram, molecular breast imaging (MBI) positive. Pathology = node negative IDC, grade I, 1.1 cm. The study was from a recent Mayo Clinic screening trial.

performed in addition to standard mammography or tomosynthesis, MBI and ultrasound are not needed for screening.

“If a woman with dense breasts is not eligible for an MRI screening, she should discuss her options with her radiologist and other healthcare providers and consider her personal tolerance for additional testing and biopsy, which may prove to be for noncancerous findings (false positives),” Dr. Berg said. “A woman should also check with her insurance carrier to see if additional screening is covered.”

Dr. O’Connor said he expects MBI to become more widespread as the technology disseminates from the early adopters to the smaller clinics. Mayo Clinic plans to conduct a multicenter trial at its centers across the country to monitor the performance of MBI. □

RICHARD S. DARGAN is writer based in Albuquerque, N.M., specializing in healthcare issues.

The Mayo Clinic and several of its investigators receive royalties through licensing agreements for MBI. Wendie Berg, M.D., Ph.D., of the University of Pittsburgh School of Medicine (UPSM), performs manuscript preparation and data analysis for Supersonic Imagine; the UPSM radiology department receives equipment and research support from Hologic, Inc., and GE Healthcare and equipment support from Gamma Medica, Inc.

WEB EXTRAS

📄 Access an abstract of the study, “Molecular Breast Imaging at Reduced Radiation Dose for Supplemental Screening in Mammographically Dense Breasts,” at ajronline.org

📺 View a video of lead author on the *AJR* study and Mayo Clinic physician Deborah J. Rhodes, M.D., discussing molecular breast imaging: [Youtube.com/watch?v=ray4ICX6Zel](https://www.youtube.com/watch?v=ray4ICX6Zel)

🌐 Access the education website focusing on breast density and supplemental screening recently launched by Wendie Berg, M.D., Ph.D., at DenseBreast-info.org

Surveying Referring Physicians Benefits Radiologists

BY MARY HENDERSON

In an era of sophisticated business analytics and elaborate social media campaigns, one low-tech tool can still deliver impressive results: a survey of key stakeholders.

FOR THE DEPARTMENT OF RADIOLOGY AT New York University (NYU) Langone Medical Center, conducting surveys of referring physicians has resulted in significant quality improvements as well as greater collaboration between radiologists and clinicians.

"It's important to reach out to our key stakeholder group because our perspective may be different than that of referring physicians," said Andrew Rosenkrantz, M.D., associate professor at NYU, in a presentation of the department's quality initiative at RSNA 2014. "They may have concerns but might not necessarily come forward with them."

The department created a multidisciplinary committee that not only went to great lengths to develop the survey—winnowing the list of potential questions to a manageable 10 for brevity's sake—but also to distribute the survey to as many referring physicians as possible, mailing, e-mailing and handing the survey directly to clinicians during consultations and at conferences.

A total of 93 completed surveys were returned, representing a broad sampling of NYU's referring clinicians. Once the feedback was reviewed, the committee wasted no time implementing quality improvements.

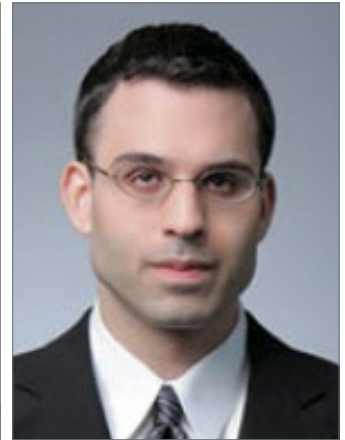
Focusing on Clinicians

"We have limited resources, so getting feedback and hearing what's important to the clinician shows us where to focus our energy," said Danny Kim, M.D., assistant professor and the Department of Radiology's Director of Quality and Patient Safety. "Their suggestions show us where we can add value."

A common theme emerging from the survey feedback was a desire among referring physicians for more structured and standardized radiology reports, Dr. Kim said. In response, the department developed structured report templates and standardized lexicon to consistently communicate the



Kim



Rosenkrantz

level of confidence in diagnoses. A request for standardized instructions for pre-medication requirements for various imaging procedures prompted the department to create and distribute a one-page summary of requirements to clinicians.

To develop standardized recommendations for common and incidental findings, the Department of Radiology initiated collaborative work sessions with clinical specialists. For example, follow-up recommendations for ovarian cysts were established in cooperation with OB/GYN physicians.

"As the quality of imaging has increased, we have more incidental findings and we need guidance on how to deal with those," Dr. Kim said. "It's not just radiologists determining what that follow up should be. We have developed collaborative guidelines supported by multiple departments that have identified the best management for a specific finding."

In the 12 months following the survey, the department also provided education on American College of Radiology (ACR) Appropriateness Criteria, embedded radiology reading rooms in a variety of clinical areas, and expanded evening and weekend radiology coverage.

"We were very active throughout the year," Dr. Rosenkrantz said. "We accomplished a lot."

"We have limited resources, so getting feedback and hearing what's important to the clinician shows us where to focus our energy."

DANNY KIM, M.D.

Collaborative Decision-Making

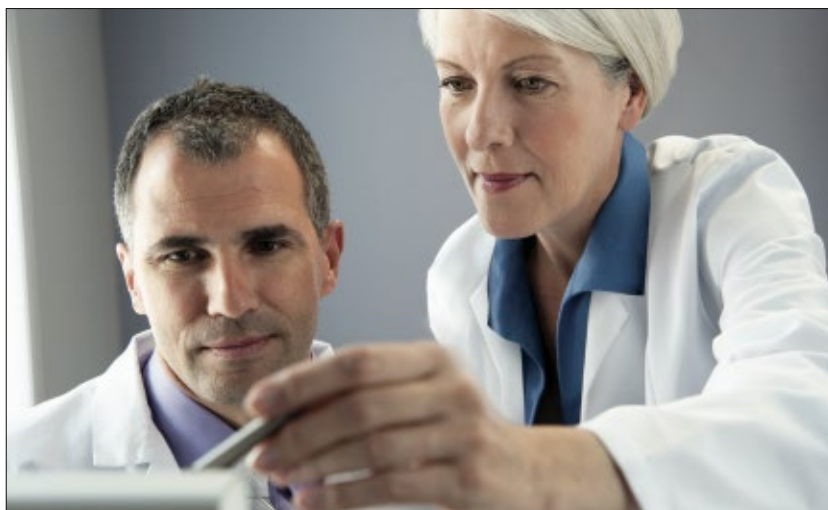
A re-survey of referring physicians a year later revealed significant improvement across the majority of quality measures. The department also showed referring clinicians that their input mattered by publishing a booklet listing the departmental changes that occurred as a result of their feedback and distributing it throughout the hospital.

“[In the past] some surveys had been done but we didn’t really have the infrastructure to follow up and carry through with changes based on survey results,” Dr. Rosenkrantz said. “People would say, ‘You did the survey but nothing ever happened afterward.’ To do a survey and be accountable and to act upon feedback we received was a change,” he said. “It’s incumbent upon us to improve those things.”

Even more importantly, the booklet documenting quality improvements—now in its second edition—opened up lines of communication between the Department of Radiology and other clinical areas.

“Now, other departments are asking to collaborate with us,” Dr. Kim said. “They see we follow through and make improvements and they are motivated to collaborate. Now I get asked, ‘How can we work together?’”

As a result, NYU radiologists have an opportunity to more fully participate in what has historically been one-sided decision-making, Dr. Kim said.



Surveying referring physicians gives radiologists critical feedback they might not otherwise have. “Their suggestions show us where we can add value,” said Danny Kim, M.D.

“Clinical specialists tend to work in silos without much collaboration between departments,” he said. “We are changing that by working together to figure out the best way to manage the patient. The radiologist’s report is only part of the equation. What’s the impact on clinical decision-making? What happens next to the patient? We want to make sure every patient has a good outcome.” □

MARY HENDERSON is a writer based in Bloomington, Ind., specializing in health and medicine.

RSNA TOOLS AID COMMUNICATION WITH REFERRING PHYSICIAN

As a tool to communicate information to referring physicians, the radiology report is a critical component of patient care. Because radiology reports also record information for future use and serve as the legal record that documents the episode of care, it critical that the report be uniform, comprehensive, easily managed and “readable” to humans and machines alike.

The RSNA radiology reporting initiative (RSNA.org/Reporting_Initiative.aspx) is improving reporting practices by creating a library of clear and consistent report templates that make it possible to integrate all of the evidence collected during the imaging procedure, including clinical data, coded terminology, technical parameters, measurements,

annotations and key images. The free library of radiology report templates is available at Radreport.org.

As images, imaging reports and medical records move online, radiologists need a unified language to organize and retrieve them. To that end, RSNA developed RadLex, a comprehensive lexicon—a unified language of radiology terms—for standardized indexing and retrieval of radiology information resources. With more than 68,000 terms, RadLex® satisfies the needs of software developers, system vendors and radiology users by adopting the best features of existing terminology systems while producing new terms to fill critical gaps. Go to RSNA.org/RadLex.aspx.



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Synergy of Radiation and Immunotherapy in Melanoma Treatment



Zachary S. Morris, M.D., Ph.D.

In pre-clinical murine tumor models, 2013 RSNA Research Resident Grant recipient **Zachary S. Morris, M.D., Ph.D.**, identified a cooperative therapeutic interaction between radiation and tumor-directed antibodies resulting in improved tumor control through activation of an anti-tumor innate immune response. This finding bears immediate clinical relevance because both radiation and tumor-specific antibodies are established treatment modalities that are used independently to treat a variety of cancers. Consequently, these results may inform and guide novel approaches to combining these treatments to improve local tumor control. The results of this work have been compiled and submitted in a manuscript for publication and have enabled successful application for additional grant funding to support studies that are now exploring the capacity of combined radiation and tumor-specific antibody treatment to augment the anti-tumor immune response elicited by other immunotherapies.

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The RSNA R&E Foundation provides the research and development that keeps radiology in the forefront of medicine. Support your future—donate today at RSNA.org/Donate.

Radiology in Public Focus

Press releases were sent to the medical news media for the following articles appearing in recent issues of *Radiology*.

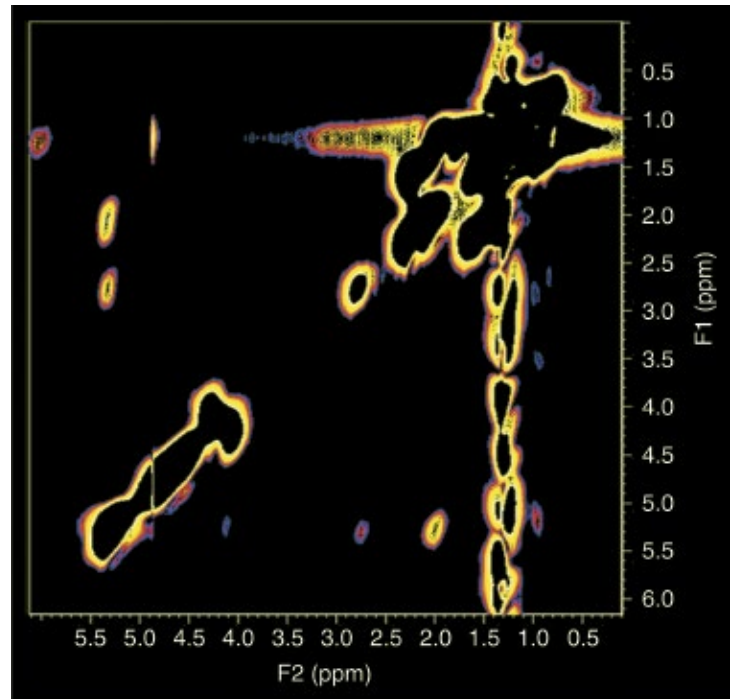
Lipid and Metabolite Deregulation in the Breast Tissue of Women Carrying BRCA1 and BRCA2 Genetic Mutations

INFORMATION PROVIDED by localized correlated spectroscopy (COSY) may provide women carrying BRCA gene mutations with an objective means to monitor biochemical changes taking place in their breast tissue, new research shows. Results need to be confirmed in a larger population.

Saadallah Ramadan, Ph.D., of the Centre for MR Health, Newcastle, Australia, and colleagues recorded in vivo localized COSY images at 3 T in the breast tissue of women carrying BRCA1 (n = 9) or BRCA2 (n = 14) gene mutations, comparing them with images in healthy controls with no family history of breast cancer (n = 10). Results showed:

- Women carrying BRCA gene mutations have metabolic deregulations in their breast tissue that may be precursors to malignant transformation.
- Women carrying BRCA1 gene mutations exhibited a reduction of 79 percent in metabolite level, while both lipid unsaturation and triglyceride levels increased by 19 percent.
- Women carrying BRCA2 gene mutations showed an increased lipid unsaturation of 21 percent.
- The metabolic changes in women carrying BRCA1 gene mutations are different from those in women carrying BRCA2 gene mutations, with a 47 percent increase in cholesterol level recorded in those with BRCA2 gene mutations.

“Despite no evidence of any changes to breast tissue from current imaging modalities, in vivo 2D localized COSY MR spectroscopy enables identification of biochemical abnormalities that may represent pre-invasive changes in the breast tissue of women carrying the BRCA1 or BRCA2 gene mutation,” the authors write.



Typical localized correlated spectroscopy (COSY) spectra in an apparently healthy 56-year-old woman with BRCA1 mutation.

(*Radiology* 2015;275;3:InPress) ©RSNA 2015 All rights reserved. Printed with permission.

Patient Perspectives and Preferences for Communication of Medical Imaging Risks in a Cancer Care Setting

A SUBSTANTIAL GAP exists between patient expectations and current practices for providing information about medical imaging tests that involve the use of radiation, according to a new study.

Raymond H. Thornton, M.D., of Memorial Sloan Kettering Cancer Center in New York City, and colleagues sought to identify opportunities for improving patient-centered communication. Although the patients in six focus groups were aware of the long-term cancer risk from exposure to ionizing radiation, most participants reported that their healthcare provider did not initiate discussion about benefits and risks of radiation from imaging tests.

Most patients obtained information through self-directed Internet searches. Participants expressed gratitude for tests (“CT saved my daughter’s life,” “I’d rather have the radiation

dosage than being opened up”), yet they expressed concern about having to initiate discussions (“If you don’t ask, nobody is going to tell you anything”) and the desire to be offered information concerning the rationale for ordering specific imaging examinations, intervals for follow-up imaging and testing alternatives. Such information should be routinely available, participants said. In addition, participants said conversations with their personal physician or endorsed, readily available reference materials are ideal methods of information exchange.

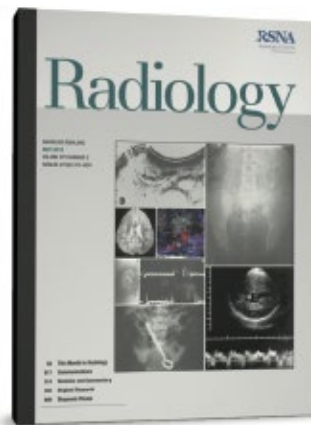
“Participants reported that active exchange of relevant information between doctors and patients remains practically nonexistent. This appears to be an especially important gap in care for cancer survivors, a group that has grown in size to approximately 4 percent of the U.S. population,” the authors write.

New on RadiologyInfo.org

Visit *RadiologyInfo.org*, the public information website produced by the RSNA and ACR, for radiologic topics and information related to men's health, including:

- Abdominal Aortic Aneurysm (AAA)
www.RadiologyInfo.org/en/info.cfm?pg=abdoaneurysm
- Benign Prostatic Hyperplasia
www.RadiologyInfo.org/en/info.cfm?pg=bph
- Prostate Cancer Treatment
www.RadiologyInfo.org/en/info.cfm?pg=pros_cancer
- Prostate Ultrasound
www.RadiologyInfo.org/en/info.cfm?pg=us-prostate
- Prostate MRI
www.RadiologyInfo.org/en/info.cfm?pg=mr_prostate

RadiologyInfo.org
For patients



Media Coverage of RSNA

In February, 1,432 RSNA-related news stories were tracked in the media. These stories reached an estimated 824 million people.

Coverage included *U.S. News & World Report*, *Yahoo! News*, *NPR.org*, *The Boston Globe*, Fox News Channel, *CNBC.com*, *Washington Examiner*, *TIME*, Business Wire, KCBS-TV (Los Angeles), WBBM-TV (Chicago), WLS-TV (Chicago), KTVT-TV (Dallas) and *Auntminnie.com*.

JUNE PUBLIC INFORMATION OUTREACH PUTS FOCUS ON MEN'S HEALTH

In recognition of Men's Health Awareness Month in June, RSNA is distributing public service announcements (PSAs) focusing on abdominal aortic aneurysm (AAA), a leading cause of sudden death for men over age 60.

The RSNA "60-Second Checkup" audio program also will be distributed to nearly 100 radio stations across the U.S. and will focus on benign prostatic hyperplasia.

Residents & Fellows Corner

Explore RSNA 2014 Career Essentials Videos

Anyone who missed the RSNA 2014 Resident and Fellow Committee (RFC) Symposium or would like a refresher on the wide range of sessions offered at the annual meeting can view videos of the presentations on RSNA.org/Trainees.

Presented by RSNA's Resident and Fellow Committee, the sessions focused on career-related issues including academia versus private practice, the job market, interviewing and financial management. Videos include:

- "Why I Joined an Academic Practice,"
Tejas S. Mehta, M.D., M.P.H.
- "Essential Tools and Strategies for Optimizing Your Job Search,"
Richard E. Sharpe, Jr., M.D., M.B.A.,
RFC Chairman
- "What You Should Know About the Job Market,"
Lawrence R. Muroff, M.D.



Journal Highlights

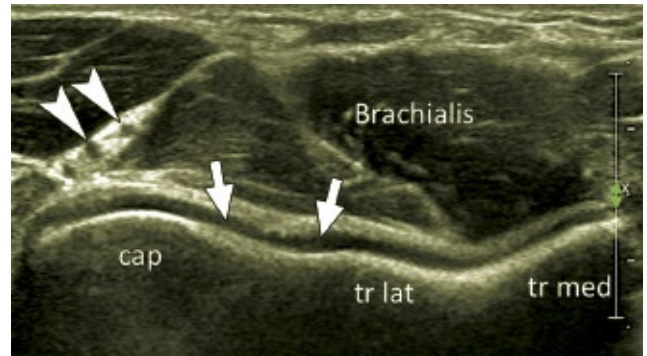
The following are highlights from the current issues of RSNA's two peer-reviewed journals.

Elbow US: Anatomy, Variants, and Scanning Technique

Keys to a successful ultrasonography (US) examination of the elbow include understanding the relevant anatomy, imaging the structures with the correct technique, eliminating common artifacts and evaluating for disease while being aware of major pitfalls.

In an article in the June issue of *Radiology* (RSNA.org/Radiology), co-authors Alberto S. Tagliafico, M.D., Biana Bignotti, M.D., and Carlo Martinoli, M.D., of the University of Genoa in Italy, describe the US scanning technique for the elbow, related anatomy, primary variants and scanning pitfalls. The authors note:

Radiology

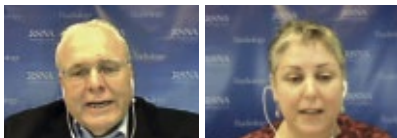


The osteochondral surface of the distal humeral extremity can be identified based on its wavy appearance and bilayered structure formed by a superficial hypochoic band of articular cartilage and a deep linear echo related to the subchondral bone. Anterior transverse US image over the distal humeral extremity demonstrates a wavy osteochondral surface consisting of the convex capitellum (*cap*) and the concave trochlea that exhibits two facets, lateral (*tr lat*) and medial (*tr med*). The articular cartilage appears as a uniform hypochoic band (*arrows*) overlying the subchondral bone. (*Radiology* 2015;275;3:636-650) ©RSNA 2015 All rights reserved. Printed with permission.

- High-resolution probes are mandatory for a comprehensive elbow assessment.
- Positioning the elbow appropriately, along with correct transducer placement, is essential in performing elbow US.
- At the anterior elbow, the distal biceps and the brachialis are identified by two tendons. US is able to differentiate the two distinct components of the distal biceps tendon, which belong to the long and short heads of the biceps, respectively.
- Dynamic scans are helpful in evaluating ligaments and tendons. Performing provocative maneuvers can be useful to accentuate a pathologic condition. Ulnar nerve evaluation should be done with both static and dynamic maneuvers.

“The use of US for elbow evaluation enhances the clinical examination and it should be routinely proposed, especially in cases with uncertain diagnoses,” the authors write.

This article meets the criteria for *AMA PRA Category 1 Credit*. SA-CME is available online only.



Radiology
EXTRA
PODCASTS

Listen to *Radiology* Editor Herbert Y. Kressel, M.D., deputy editors and authors discuss the following articles in the April issue of *Radiology* at RSNA.org/Radiology-Podcasts.

- “Glioblastoma: Imaging Genomic Mapping Reveals Sex-specific Oncogenic Associations of Cell Death,” Rivka R. Colen, M.D., and colleagues.
- “Variations in the Intensive Use of Head CT for Elderly Patients with Hemorrhagic Stroke,” Kimon Bekelis, M.D., and colleagues.

“Golden Oldies” Spotlighted in June *Radiology* Issue

As part of the RSNA Centennial celebration, *Radiology* is featuring 15 articles each month based on their significance to the advancement in the field of radiology in a special supplement, “Golden Oldies.” The June issue spotlights genitourinary advancements, including:

- An early serious publication on excretory urography; 1930
- Natural History of Arterial Disease; 1968
- Benign and malignant adrenal masses: CT distinction with attenuation coefficients, size, and observer analysis; 1991

The online-only articles will be available to RSNA members and *Radiology* subscribers. For more information, and to view a video of *Radiology* Editor Herbert Y. Kressel, M.D., and Senior Deputy Editor Deborah Levine, M.D., discussing the series, go to RSNA.org/Golden-Oldies.

Radiology
GOLDEN OLDIES

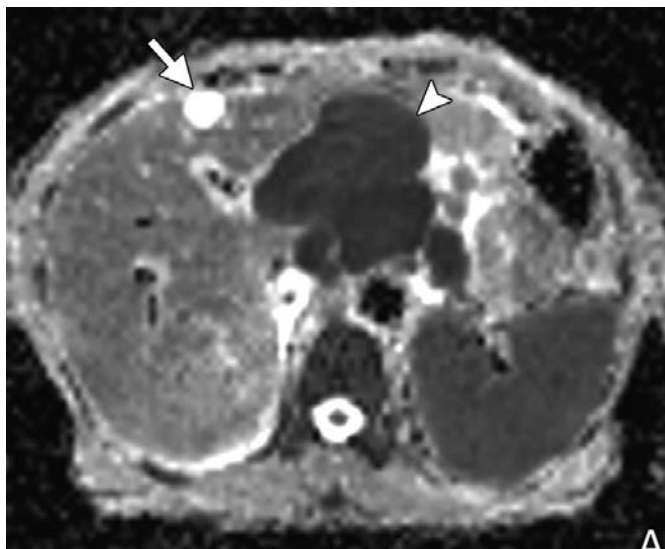
Whole-Body Diffusion-weighted MR Imaging in Patients with Hodgkin Lymphoma and Diffuse Large B-cell Lymphoma

Whole-body diffusion-weighted (DW) MR imaging with apparent diffusion coefficient (ADC) mapping is emerging as a promising tool for lymphoma staging and treatment response assessment.

In an article in the May-June issue of *RadioGraphics* (RSNA.org/RadioGraphics), Sarah Toledano-Massiah, M.D., of CHU Henri Mondor in Creteil, France, and colleagues review their four years of research with 1.5-T and 3-T whole-body DW MR imaging used with 18F- fluorodeoxyglucose (FDG) PET/CT at baseline, interim and end of treatment in patients with Hodgkin lymphoma and diffuse large B-cell lymphoma. The authors also discuss the spectrum of imaging findings and the potential pitfalls, limitations and challenges associated with whole-body DW MR imaging in these patients.

DW MR imaging noninvasively depicts the random microscopic motion of water molecules in the body, which depends on cellularity and cell membrane integrity. Because of their high cellularity and high nucleus-to-cytoplasm ratio, lymphomas have a lower ADC value than other tumors.

"DW imaging is emerging as a powerful clinical tool in the care of patients with cancer and can provide unique information related to tumor cellularity and integrity of the cellular membrane. In patients with lymphoma, whole-body DW imaging can be clinically useful for disease detection, lesion characterization and assessment of treatment response," the authors write.



Lesion detection in a 79-year-old man with diffuse large B-cell lymphoma (DLBCL). Axial ADC map shows celiac lymph nodes as hypointense relative to muscle (arrowhead), a finding indicative of restricted diffusion. The involved lymph nodes were hyperintense on 1.5-T diffusion-weighted (DW) images. A subcapsular anterior left lobe liver nodule (arrow), which was hyperintense at low-b-value DW imaging and hypointense at high-b-value DW imaging, shows a high ADC value, findings consistent with a biliary cyst.

(*RadioGraphics* 2015;35:747-764) ©RSNA 2015 All rights reserved. Printed with permission.

This article meets the criteria for *AMA PRA Category 1 Credit*™. SA-CME is available online only.

Value of Membership

RSNA Career Connect™ Brings Job Seekers, Employers Together



Whether you are a student seeking that first radiology job or a seasoned radiologist looking for a career move, RSNA Career Connect™ offers many tools and options to aid your job search.

Features include:

- **Free resume posting**—Simply upload your resume in a word or text document to the online database. Each resume is searchable by employers who currently have jobs posted on the site.
- **Job search**—Find the radiology job that meets your qualifications. RSNA searches offer job and company information, giving you the tools you need to succeed, 24 hours a day. Create a search agent to filter the radiology jobs that match your needs or modalities and receive e-mails when these job types become available.

Career Connect also benefits radiology employers and is tailored to fulfill staffing needs. Employers can enhance their candidate search for a nominal fee by placing an ad in the Employer Spotlight—an area highlighted at the top of all job search results pages.

For more information, visit RSNA.org/Career. For questions, contact Janet Swanson at 630-571-7817 or jswanson@rsna.org.

Education and Funding Opportunities

New Refresher Courses Available Online

RSNA continues to be your source for radiology continuing education on RSNA.org/Library. New this year, courses have been streamlined to offer the busy radiologist better education on specific disease entities, specialized imaging techniques, and other concerns related to subspecialty areas.

Designed with both desktop and tablet experiences in mind, each course includes a visual presentation side-by-side with speaker commentary. Users can toggle between the transcript and a full listing of slides. Each refresher course dynamically tracks the user's progress and bookmarks the last known location.

A CME test offered at the end of all courses allows users to enter answers and receive immediate feedback. Users may then revisit the multiple-choice questions and remediation provided for each question. CME credit is earned by correctly answering all of the questions. Users who don't achieve a passing score may select the "Retry Test" button. There are no limits on the number of times a CME test can be re-tried.

New courses will be posted on RSNA.org/Library as soon as they become available. Use the "Browse New" filter to see RSNA's most recently released online education.



Online refresher courses offer an audiovisual presentation complete with a side-by-side transcript.

RSNA CLINICAL TRIALS METHODOLOGY WORKSHOP

January 8-15, 2016
La Jolla, California
Applications due
June 15, 2015

Over the course of this 6 1/2-day workshop, participants will learn how to develop protocols for the clinical evaluation of imaging modalities. Each trainee will be expected to develop a protocol for a clinical study, ready to include in an application for external funding. A dynamic and experienced faculty will cover topics including:

Applicants should be junior faculty members engaged in clinical research in radiology, radiation oncology or nuclear medicine academic departments. Familiarity with basic concepts and techniques of statistics and study design is required. Applications will undergo a competitive selection process. Attendees will participate in group and individual learning, including preparative readings, didactic sessions, one-on-one mentoring, small group discussions, self-study and individual protocol development.

A dynamic and experienced faculty will cover topics including:

- Principles of clinical study design
- Statistical methods for imaging studies
- Design and conduct of multi-institutional studies
- Sponsorship and economics of imaging trials
- Regulatory processes

Applicants will undergo a competitive selection process for course entrance. Familiarity with basic concepts and techniques of statistics and study design is required of all applicants. Once admitted, trainees participate in group and individual learning, including preparative readings, didactic sessions, one-on-one mentoring, small group discussions, self-study and individual protocol development. Accepted participants are responsible for all travel expenses and on-site hotel accommodations. There is no separate fee for this course. Online application and additional information can be found at RSNA.org/CTMW.

More information and application/nomination forms are available at RSNA.org/CTMW.

Register for 2015 CORE Workshop

The 2015 Creating and Optimizing the Research Enterprise (CORE) workshop will be held on Friday and Saturday, October 2-3, 2015, in Oak Brook, Ill. The workshop will focus on strategies for developing and/or expanding research programs in radiology, radiation oncology and nuclear medicine departments. New sessions include Managing Research Finances in the Era of Constrained Resources and Building Diversity in Imaging Research. The CORE program features a combination of presentations, case studies and group discussions.

More information and free registration is available at RSNA.org/CORE.

RSNA Advanced Course in Grant Writing

Applications due
July 1, 2015

Applications are now being accepted for this course designed to assist participants—generally junior faculty members in radiology, radiation oncology or nuclear medicine programs—prepare and submit a National Institutes of Health, National Sciences Foundation or equivalent grant application. The course, held at RSNA Headquarters in Oak Brook, Ill., will consist of four two-day sessions:

Session I: September 25-26, 2015

Session III: March 18-19, 2016

Session II: January 22-23, 2016

Session IV: May 6-7, 2016

For more information and to download an application, go to RSNA.org/AGW.

Applicants Sought for RSNA Derek Harwood-Nash International Fellowship

Application deadline
for 2016 program is
July 1, 2015

The Derek Harwood-Nash Fellowship program supports international scholars pursuing a career in academic radiology to study at North American institutions. Accepted participants will receive a stipend of up to \$10,000 from RSNA to be used toward travel, living expenses and educational materials for the six- to 12-week fellowship period.

Interested candidates must be promising international radiology scholars who have completed their radiology training, are embarking on a career in academic radiology (i.e., have held a faculty position for three to 10 years), and who demonstrate that their specific educational goals can be met most appropriately by a course of study in a North American institution.

Applications for the 2016 RSNA Derek Harwood-Nash Fellowship are available at RSNA.org/DHN. For more information e-mail CIRE@rsna.org.

RSNA/AUR/ARRS Introduction to Academic Radiology Program

Applications due
July 15, 2015

Sponsored by RSNA, the American Roentgen Ray Society (ARRS) and Association of University Radiologists (AUR), the Introduction to Academic Radiology program:

- Exposes second-year residents to academic radiology
- Demonstrates the importance of research in diagnostic radiology
- Illustrates the excitement of research careers
- Introduces residents to successful clinical radiology researchers

Successful applicants will be assigned to either a seminar held during the RSNA Scientific Assembly in Chicago, November 29-December 3, 2015, or the ARRS Scientific meeting in Los Angeles, April 17-22, 2016. A \$1,000 award will be made to the departments of accepted applicants to be used to help advance the applicant's academic career. More information and application/nomination forms are available at RSNA.org/ITAR.



For Your Calendar

JUNE 6, 2015

American Medical Association-Medical Student Section Medical Specialty Showcase
Hyatt Regency Chicago
Visit the [RSNA Booth](#)
• www.ama-assn.org

JULY 20-23, 2015

The Association for Medical Imaging Management (AHRA), Las Vegas
Visit the [RSNA Booth](#)
• www.ahraonline.org

SEPTEMBER 22, 2015

Faculty Skills Update
Westin O'Hare, Chicago
Registration Opens Soon
• RSNA.org/Faculty-Skills-Update

SEPTEMBER 25-26, 2015

Advanced Course in Grant Writing: Session I
RSNA Headquarters, Oak Brook, Illinois
Application Deadline is July 1
• RSNA.org/AGW

OCTOBER 2-3, 2015

Creating and Optimizing the Research Enterprise (CORE) Workshop
RSNA Headquarters, Oak Brook, Illinois
Registration Now Open
• RSNA.org/CORE

OCTOBER 18-21, 2015

American Society for Radiation Oncology (ASTRO), San Antonio
Visit the [RSNA Booth](#)
• www.astro.org

NOVEMBER 28, 2015

NIH Grantsmanship Workshop
McCormick Place, Chicago
RSNA 2015 Course Enrollment Opens July 8
• RSNA.org/Register

JANUARY 9-15, 2016

Clinical Trials Methodology Workshop
La Jolla, California
Application deadline is June 15, 2015
• RSNA.org/CTMW

JANUARY 22-23, 2016

Advanced Course in Grant Writing: Session II
RSNA Headquarters, Oak Brook, Illinois
Application Deadline is July 1, 2015
• RSNA.org/AGW

MARCH 18-19, 2016

Advanced Course in Grant Writing: Session III
RSNA Headquarters, Oak Brook, Illinois
Application Deadline is July 1, 2015
• RSNA.org/AGW

MAY 6-7, 2016

Advanced Course in Grant Writing: Session IV
RSNA Headquarters, Oak Brook, Illinois
Application Deadline is July 1, 2015
• RSNA.org/AGW

FIND MORE EVENTS AT
RSNA.org/Calendar.aspx

Annual Meeting Watch

News about RSNA 2015

Important Dates for RSNA 2015

- June 3** General registration opens
July 8 Preliminary meeting program available
October 16 International badge mailing deadline
November 6 Deadline for discounted registration and hotel reservations



RSNA 2015 Registration

There are four ways to register for RSNA 2015:

- Internet**
Fastest way to register!
Go to RSNA.org/Register
- Telephone (Monday-Friday)**
8:00 a.m.-5:00 p.m. CT
1-800-650-7018
1-847-996-5876
- Fax (24 hours)**
1-888-772-1888
1-301-694-5124
- Mail**
Experient/RSNA 2015
PO Box 4088
Frederick, MD 21705
USA

Registration Fees - Valid Until Nov. 6

MCCORMICK PLACE	VIRTUAL	COMBO	
0	\$100	\$100	RSNA/AAPM Member
0	25	25	RSNA Member-in-Training, RSNA Student Member
0	300	300	Non-Member Student
200	300	500	Non-Member Resident/Trainee
200	300	500	Radiology Support Personnel
900	300	1,200	Non-Member Radiologist, Physicist or Physician
900	300	1,200	Hospital or Facility Executive, Commercial Research and Development Personnel, Healthcare Consultant and Industry Personnel
325	300	625	One-day registration to view only the Technical Exhibits

For more information about registration at RSNA 2015, visit RSNA.org/Register e-mail rsna@experient-inc.com, or call (800) 650-7018.

International Visitors



Invitation Letters Available – Act Now for Visa!

Personalized invitation letters to RSNA 2015 are available by request during online registration. Visit RSNA.org/Visa for important information about the visa application process. Visa applicants are advised to apply as soon as they decide to travel to the United States and at least three to four months in advance of their travel date. International visitors are advised to begin the visa process now.

Buy Bistro RSNA Tickets Now

Avoid long lines by purchasing Bistro RSNA tickets earlier this year. Advance tickets to Bistro RSNA—which provides a comfortable setting for attendees to eat, meet, and network during the annual meeting—are only \$22 per ticket.

Bistro RSNA is located in both Technical Exhibit Halls. The daily lunch menu includes salads, soup, entrée choices, vegetables, pasta and more. Menu price includes full meal, beverage choices and dessert.

Purchase tickets in advance at RSNA.org/Register.



Spouse/Family Member Badges

Full conference professional registrants are entitled to one complimentary spouse/family member badge; each additional badge is \$50. This badge is intended for use by a spouse or family member (16 and over) accompanying a full conference professional registrant to the meeting. It allows access to technical exhibit halls, Lakeside Learning Center, and classrooms, space permitting, after all professional registrants have been seated. CME credit is not tracked or awarded. A co-worker or industry associate is not eligible for this badge and must register as a professional and pay the applicable registration fee.

To uphold the professional and educational standards of the RSNA annual meeting, children under 16 years of age are not permitted in the exhibit halls or sessions. To take advantage of Camp RSNA for childcare, visit RSNA.org/Register for registration information.

Revised Ethics and Professionalism Online Courses Now Tablet Friendly



Radiologic professionals who enroll in the updated Ethics and Professionalism online courses at RSNA.org/Ethics-and-Professionalism-Courses may earn up to 16.5 *AMA PRA Category 1 Credits™* which can be applied toward their ABR MOC Self-Assessment requirement (SA-CME). The tablet-friendly courses are free to RSNA members and easy to navigate. Select courses have been approved by the Commission on Accreditation of Medical Physics Education Programs (CAMPEP) for 1.50 credits each.

The Ethics and Professionalism online courses are designed to educate physicians and physicists about the attributes and nuances of ethics and professionalism that are essential to the practice of diagnostic radiology, radiation oncology and medical physics. Each course is interactive and provides unrestricted navigation for a self-paced learning experience.



Updated by the original authors and peer reviewed for content, quality and clarity, these courses provide a basic understanding of ethics and professionalism issues, including:

- Historical Evolution and Principles of Medical Professionalism
- Physician-Physician and Physician-Patient Interactions
- Personal Behavior, Peer Review, and Contract Negotiations with Employers
- Conflict of Interest
- Ethics of Research
- Human Subjects Research
- Vertebrate Animal Research
- Relationships with Vendors
- Publication Ethics
- Ethics in Graduate and Resident Education
- Professionalism in Everyday Practice; The Physician Charter

RSNA is accredited by the Accreditation Council for Continuing Medical Education (ACCME) to provide continuing medical education for physicians.

COMING NEXT MONTH

Next month, *RSNA News* reports on radiology's reaction to the U.S. Senate's April repeal of the Sustainable Growth Rate (SGR) formula that determines Medicare physician payment rates.



A NEW
CENTURY
BEGINS

100RSNA[®] 2015

INNOVATION
IS THE KEY
TO OUR FUTURE

November 29 – December 4
Meeting.RSNA.org