The complete team of technologists, radiologists, and support staff from The Breast Center of Northwest Arkansas in Fayetteville. Read about the fire in their clinic in this issue of the newsletter.
I’ve been drifting lately. No, not like snow in Montana in January. Not like a hot rod in a car chase movie. Not like a sailboat without wind. No, those drifts are perceptible in real time—we are conscious of them. My drifting is much more insidious.

Day to day, week to week, even month to month, I drift imperceptibly. We all can and most of us do. Aging (I just had a birthday) provides minuscule incremental drifts over the course of our lives. And then one day we look in the mirror and notice something different, or a trusted friend informs us, in the most caring way, that it might be time to get our eyes checked. Or she compliments us on our “distinguished” gray hair. Thanks! Thanks. Thanks? Time marches on, and we hope to enjoy it gracefully.

Many examples of drift benefit us all. Drift provides excellent opportunities for language and ecosystems and living creatures to evolve towards ever-adaptive development—a target that never stops moving. However, if we aren’t careful, our practice of radiology drifts, sometimes for the worse.

I completed my fellowship 11 years ago. My mentors were excellent. They remain excellent. I couldn’t have asked for better. And during my first years in practice, I continued to work side by side in an open reading room with a group of outstanding breast imagers who were always available for consultation. In the heat of the moment, with a diagnostic patient waiting or a biopsy about to start, I could always extract reassurance or insight to enhance my practice and, more importantly, the patient experience. We did this for each other commonly. And it helped to keep us all working within the guidelines of the Breast Imaging Reporting and Data System (BI-RADS) Atlas and the standards of care.

My practice is different now. I still work with excellent radiologists who place the patient at the top of the pyramid. Yet we do not interact as often in our busy clinic. We work predominantly in isolation. And herein lies the danger. Darwin’s finches, isolated on various Galapagos islands, evolved slowly in different directions towards the most efficient environmental model. Isolation requires us to adapt. Independence spins isolation into the positive realm. Our busy practices encourage our independence for the benefit of efficiency. We value our own independence as a sign of strength. And yet working alone we can slowly, imperceptibly, drift away from the standard of care.

Of course, it doesn’t happen all at once. We might look at some calcifications and think, “I’ve seen these so many times. They are almost never cancer. I can let these go.” Or possibly the corollary thought may flash in our subconscious: “I’ll just call these back to be on the safe side. It can’t hurt the patient.” And we do it. And nothing bad happens in the short term. And nothing good happens either. If we work with many different radiologists, we may never see the downstream result of our decision. I read the screen. Someone else reads the diagnostic. Yet another does the biopsy. A fourth does the radiologic-pathologic correlation. There is no direct feedback within the period of useful memory. And we do it again with the same results. And we slowly come to accept our slightly different practice pattern. We drift.
The worst possible outcome of drift is not our embarrassment or guilt about a decision we made years ago; it is the impact on a patient. We accept some risk in our profession and our subspecialty. We can be proud of our bravery and devotion. It binds us together as a group. We are not expected to be perfect. That is unattainable. We are expected to understand our science—the how and the why—and our standards of care for the patients.

Fortunately, we exist within the framework of the BI-RADS Atlas providing clear guidelines. I admit that I love the Atlas. I’m a rule follower. I love the clarity and the rules of the Atlas. We are lucky for it. What other specialty or subspecialty has such a guide? I am thankful to those who created it and continue to hone it. It is a difficult job requiring many hours and unfathomably deep knowledge of the subject.

The Atlas is one antidote to drift. As individuals in isolation, we can look to the Atlas electronically any time we need guidance. Individual audits inform us about our callback rates, positive predictive value, and cancer detection rates. These outcomes audits are incredibly valuable for assessing any drift over long periods of time and thousands of patients. They help us perceive the imperceptible and stay on course.

The other antidote to drift is our colleagues! We can keep each other from drifting. It may take a bit more time to pause and seek a second opinion or pause and give a second opinion. It may take some more time to arrange a morbidity and mortality conference or radiologic-pathologic conference. Yet the benefits are tremendous for connection, teamwork, and maintaining a safe practice. So my plan is to anchor myself to my colleagues and the Atlas and save the drifting for a sunny day in a raft on the river. I hope to see you there.
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President’s Column:
Unsung Heroes and Their Untold Stories

By Elizabeth A. Morris, MD, FACR, FSBI

Stories have to be told or they die, and when they die, we can’t remember who we are or why we’re here.
Sue Monk Kidd, The Secret Life of Bees

Perhaps many of you know that our society is in the process of losing a generation of giants who have recently retired or who are close to retiring. These are the founders of our society and the field of breast imaging. Perhaps, like me, many of you thought that they would be around forever. However, as the retirement announcements start to pile up, between the mixed feelings of despair and happiness, I recognize that time does indeed march on and that we owe a debt of gratitude to these pioneers for putting us on a course that nurtured breast imaging to become the distinguished specialty that it is today. Many of these people did not choose this specialty; rather, it chose them, and interestingly, many tell the same story. As the field was new, radiologists fresh out of training were by default the “experts” on breast imaging. As a result, most of them had to teach themselves and each other. In the process, they most definitely became experts, and many have interesting tales. Individually and collectively, their stories matter and lest we forget, keeping their stories alive matters to us as a society as they remind us of who we are and why we are here.

I am part of the generation that came along after much of the work on mammography and ultrasound had been done. The screening battles had been fought in this country. Life was pretty good. The Mammography Quality Standards Act was accepted. The hugely successful Breast Imaging Reporting and Data System had been integrated into the field. Accreditation and guidelines were the norm. Like many of my generation, I immersed myself with new, expensive technology such as magnetic resonance imaging and molecular imaging, which were not considered useful for screening. The screening scars safely rested with the previous generation. I was young and not that interested in what came before. All that mattered was the future.

Well, as many of you know, the older you get the more interested in history you become. Recently my dear friend and colleague, David Dershaw, MD, FACR, FSBI, one of the giants who founded the breast imaging service at Memorial Sloan Kettering Cancer Center (MSKCC), retired and we had many dinners and celebrations celebrating his life’s work. In the process I did historical digging and discovered that the first breast radiologist at MSKCC was Ruth Snyder, MD, one of the very early pioneers of breast imaging and an early advocate of screening. She was one of the first female physicians hired at MSKCC in the 1930s, yet I could find very little information about her. I contacted...
the archivist, and they found no more about her except a grainy, poor-quality candid photo. Lost to history. In this day of information overload, this seemed impossible. I had many questions about her. What was it like to suggest that x-rays could detect nonpalpable breast cancer? What were her struggles? Did she encounter resistance to her ideas? Being a woman in that era, did she struggle with acceptance? The fact that we will never know left me a huge sense of loss. It was a warning sign to me that we can’t let the stories of this current retiring generation disappear.

In this column I would like to talk about the importance of storytelling. By paying attention to our history we can be the guardians of our culture and define our story rather than letting others define it for us. We should take this opportunity to gather as many stories together as possible and archive them. To that end, the SBI is currently piecing together a timeline of breast imaging so that we don’t forget the struggles, the triumphs, the small everyday efforts of the people who came before us: the unsung heroes who take care of patients and advance our field a little every day. Individual contributions will be recognized. Hopefully this will preserve stories like Ruth’s that are lost to time. In our previous newsletter we learned about the importance of people like Gerald D. Dodd Jr, MD, who was crucial to the success of high-quality mammographic technique and interpretation. We hope to bring you more stories like that. We will encourage blog posts about prior events and discoveries. Giving voice to these memories and perspectives will lay our foundation.

Passionate battles have been fought or debated over the years (xeromammography versus film screen, film screen versus digital, and now digital versus tomosynthesis), but in the end, data and reason have always triumphed. We are a society founded on facts and data, but that doesn’t mean we need to take a page out of Ken Kesey’s book and say, “To hell with facts! We need stories!” We need both. A story incorporating both data and emotions is significantly more effective in engaging a listener than data alone. According to Dr. Jennifer Aaker, professor of marketing at Stanford, people remember information when it is weaved into stories “up to 22 times more than facts alone.” Evolutionarily, storytelling was a way to warn others of danger and likely helped keep our ancestors alive. We are hardwired to listen to stories.

In a broader context, when communicating to the public and to our patients, we need to remember the power of storytelling. If we want to move people to do great things or simply take care of their health, we need to be storytellers. Simple narratives and powerful images using stories convey lasting impressions. At the SBI, we have been investing in producing videos for online sharing not only to convey facts but also to engage people with our ideas and stories. If we focus solely on facts and data, we lose the human connection that is elemental and memorable. Using stories to reinforce our statistics will make us stronger and possibly more patient-centric than we already are.
We each need to start talking about WHY we do what we do, not only among professional colleagues but also to our patients and to the media. Every story is important. What are our personal motivations? Why do you do what you do? What is your own personal story? I stumbled into breast imaging after having signed up for a neuroradiology fellowship. From my perspective, I had found my people: not only the patients who amaze me every day but also my colleagues who are like family. I had also found my calling, a higher purpose. It was and still is the most positive and life-affirming specialty I could imagine. I’ve never looked back and I haven’t regretted the change of heart for a second. How it went down is a story that involves a lot of great people. It’s not a very important story but if anyone is interested, I’d love to tell the story to you and listen to YOUR story over coffee sometime.

Elizabeth A. Morris, MD, FACP, FSBI
President, Society of Breast Imaging
Welcome to the first installment of our planned regular column dedicated to keeping you updated on the activities of the SBI Committees. It has been a busy year, with new committees forming to meet the changing needs of our members, trainees, and patients.

Two new task forces have formed. The Quality and Value Task Force is chaired by Wendy DeMartini, MD, FSBI. This group will identify and provide solutions for practice performance issues. Their goal will be to improve imaging quality and care delivery by breast imagers. The Patient Care and Delivery Task Force will be chaired by Stamatia Destounis, MD, FACR, FSBI. This task force will identify common practice issues that can be roadblocks to providing exemplary care, develop protocols to improve patient care, and provide resources for overall patient satisfaction. The members of these task forces are professionals from small and large groups in private practice and academic institutions and hospitals. For a complete listing of committees and their members, please visit www.sbi-online.org/ABOUTSBI/Committees.aspx.

Breast Imaging Fellowship Match Committee: Chair Gary Whitman, MD, FACR, FSBI, has worked tirelessly to set up a breast imaging fellowship match through the National Residency Match Program. There are more than 74 programs participating, with 90% of available breast imaging fellowship slots in the match. Visit the SBI website for more information about the match, as well as the fellowship directory. To direct applicants and for more information regarding the match, go to www.sbi-online.org/RESOURCES/MatchInformationforApplicants.aspx.

Please notify your trainees that they must contact each individual institution for their application. There is no standard application. Additionally, they must contact each program to confirm interview dates. Many programs are already interviewing.

The dates have been set for the match:
- March 22, 2017: Registration opens
- April 26, 2017: Ranking opens
- May 31, 2017: Ranking order list deadline
- June 14, 2017: Match day
- July 1, 2018: Training begins

Online Education Committee: Chair Mary S. Newell, MD, FACR, will begin working with chairs from other committees, such as International Education Outreach, Fellowship Match, Membership, and
Scientific Advisory, to develop online education content. Some ideas are journal club, directed readings, webinars, and case of the month.

**International Education Outreach Committee:** Chair Murray Rebner, MD, FACR, FSBI, has been tasked with the development of outreach opportunities for US radiologists to travel abroad and assist in breast imaging training internationally. The committee is also outlining a proposal for a visiting professorship program for international members. They are also working on creating a needs assessment survey that SBI will send to international organizations so that we as a society can better understand the needs abroad.

**Membership – Residents and Fellows Subcommittee:** This newly formed committee, co-chaired by Sadia Choudhery, MD, and Rend Al-Khalili, MD, is working to grow membership and engage the members in training by reaching out to program chairs outlining the benefits of society membership for residents and fellows (it’s FREE!). SBI introduced a member-in-training track at the Symposium and plans to create more networking opportunities for trainees as well as social functions at the meeting. In the coming weeks they will partner with the Online Education Committee to develop new e-learning opportunities.

**SBI Foundation Committee:** Chair Phan Huynh, MD, FACR, FSBI, is formulating a campaign strategy for promoting Ellen’s Fund and for future outreach with local women’s health organizations in the cities in which the Symposium is held.

**Education/Symposium Planning Committee:** This committee, chaired by Jay Baker, MD, FACR, FSBI, has been invited and will meet early next year to begin planning the 2018 Symposium in Las Vegas.

A lot is happening to keep SBI moving forward on all fronts, thanks to the boundless energy of its dedicated members and staff. ✤
American College of Radiology Intersociety Summer Conference 2016: Big Data and Machine Learning

By Elissa R. Price, MD, FRCPC, FSBI; Steve Poplack, MD, FSBI

Every year, the American College of Radiology (ACR) hosts the Intersociety Summer Conference (ISC), a conference of representatives from approximately 50 radiology-related medical specialties. The topic of the ISC this year was Big Data and Machine Learning. As breast imagers, we may be unfamiliar with these topics, but they loom large in our future.

Big data refers to "extremely large data sets that may be analyzed computationally to reveal patterns, trends, and associations." In medicine, these data consist of demographics, medical history, imaging results, operative reports, patient encounters, treatment records, insurance information, etc. Currently isolated in separate information systems, these data will hopefully become integrated in the electronic medical record. The faculty discussed how big data may be used by radiologists to enhance interpretation and how image data may be integrated to improve patient management. Breast imaging was viewed as the model subspecialty for big data analytics because of the early adoption of the Breast Imaging Reporting and Data System (BI-RADS), which provided a structured language for data analysis.

The second major focus of the conference was machine learning. Machine, or "deep," learning is the computer analysis of information to make higher-level inferences—basically, an attempt to replicate the complex neuronal activities of the human brain. The creation of this artificial neural network requires 3 steps: (1) preparation of training material, (2) iterative learning, and (3) application/validation. Take the example of computer recognition of apples. The first step is the preparation of structured training materials (verified apples of different types, shapes, colors, etc). As the training takes place, the neural network is adjusted in response to test outcomes. If a training event has an incorrect outcome (an apple misidentified), the weights and biases within the network are correspondingly adjusted, while the desired outcome (a correctly identified apple) is reinforced. This iterative process ultimately allows the network to make inferences (eg, correctly identify apples not seen before). Once the desired accuracy has been achieved, a new data set is applied for validation purposes. Networks like this can be trained to recognize items, people, or perhaps diseases like breast cancer.
To continue the metaphor, breast imaging is "ripe for the picking." We have BI-RADS and we have big data sets that could be made available to train an artificial neural network. In fact, they are already being made available in the Digital Mammography DREAM Challenge (see the related article in this issue of the newsletter). Course faculty noted that some large information technology (IT) companies were setting their sights on the medical marketplace with a mindset to bypass the radiologist altogether.

A section of the ISC was devoted to the impact of machine learning and IT advances on trainees. Important questions were raised. Are we educating our trainees appropriately? Is it time to augment traditional physics with IT science? A panel of residents, fellows, and junior attending physicians convened to share their views. While the trainees voiced excitement at some of the technological advances, there was substantial concern that the role of the radiologist is in jeopardy. Trainees mentioned specifically choosing to specialize in intervention-focused fields to avoid being "replaced." These sentiments garnered a mixed response from the other attendees. Most believed that radiologists should not fear being replaced by computer programs, not only because not all cases “follow the rules” and need to be put in clinical context but also because in the Imaging 3.0 paradigm, we are valued for managing the role of imaging in a complex medical environment. Our value as breast imagers stems from our wide range of skills in complex image interpretation, in patient education, in performing procedures, and in integrating imaging findings within the clinical context to optimize patient care. We must emphasize our important role in the breast care team, reinforce the strong collaborative relationships with our breast surgeons and oncologists, and focus on meaningful patient interactions.

Other significant technological innovations were discussed at the ISC—in particular, how to use computer technology to the benefit of radiologists and our referring clinicians. Two examples highlight the potential of harnessing IT: (1) Computer-generated graphic reporting: replace semantic reports cataloging index lesions with graphic displays of lesion size changes over time in conjunction with chemotherapy. (2) Computer-assisted workflows: instead of placing all of the burden of data collection on the radiologist, these data (eg, allergies, laboratory tests [international normalized ratio], key images, and procedural approaches) could be pre-fetched for the interventional radiologist.

This year’s ISC underscored that machine learning is coming to radiology, and breast imaging will be an early focus. This ship is sailing, and we need to be aboard. We must engage the process. We need to embrace opportunities as well as acknowledge challenges, while continuing to ensure our role as key members of the breast care team.

**REFERENCE**

The DREAM Challenge is a nonprofit open-science effort challenging participants to develop artificial neural networks that can accurately solve biological problems. Previous Challenges have involved Alzheimer disease, acute myeloid leukemia, prostate cancer, and respiratory infections.

The Digital Mammography DREAM Challenge is currently underway! (https://www.synapse.org/Digital_Mammography_DREAM_Challenge)

This DREAM challenge tasks competitors to write a computer program that, in essence, correctly reads a mammogram. Six hundred forty thousand de-identified mammograms with corresponding clinical variables have been provided from the Breast Cancer Surveillance Consortium and the Icahn School of Medicine at Mount Sinai. Subsets of this pool will serve as the structured data with which Challenge competitors will train their neural networks. Once trained, the networks are submitted for further testing and validation. While computer scientists are writing the programs for this Challenge, breast imagers need to be important team members, focusing on clinical issues that are our area of expertise. An entire article in an upcoming Newsletter will focus on the Digital Mammography DREAM Challenge—stay tuned!
Two important things will happen on Tuesday, November 8, this year. One is the fifth International Day of Radiology (IDoR, http://www.internationaldayofradiology.com). The IDoR is a joint venture of the European Society of Radiology, American College of Radiology (ACR), and Radiological Society of North America. This year the IDoR will concentrate on breast imaging, and the SBI and European Society of Breast Imaging will contribute. What is the IDoR? From the website: “The International Day of Radiology is an annual event held with the aim of building greater awareness of the value that radiology contributes to safe patient care, and improving understanding of the vital role radiologists play in the healthcare continuum.” The SBI has a page dedicated to the IDoR (https://www.sbi-online.org/RESOURCES/InternationalDayofRadiology.aspx). The ACR also explains the IDoR (http://www.acr.org/Meetings-Events/IDOR). The ACR suggests some ways to participate in the IDoR:

1. Participate in IDoR activities.
2. Sponsor a community event to demonstrate the importance of annual breast cancer screening starting at age 40 years.
3. Hold a workshop, lecture, webinar, open house, or tweet chat for medical professionals or consumers.
4. Post, share, like, and retweet information from social media accounts (use #IDoR2016).
5. Include IDoR information on your website.
6. Publish articles in your newsletter.
7. Recognize the accomplishments of your professional team.
8. Draft a news release or op-ed and send it to local media.
9. Request an official proclamation by a local governing body.

The Activities page of the IDoR website (http://www.internationaldayofradiology.com/activities/) lists the events of the past 4 IDoRs. The IDoR also maintains a Facebook page (https://www.facebook.com/internationaldayofradiology) for upcoming activities planned in countries around the world.

Why November 8? That is the fateful day Wilhelm Conrad Röntgen discovered the x-ray in 1895. Now, what was that other thing happening on this Tuesday in November 2016?
The SBI is publishing a series of articles across multiple newsletters that summarize critical aspects of the scientific data related to screening mammography. Recognizing the constant barrage against screening, these short pieces provide concise and pivotal information. Our hope is that anyone—technologist, radiologist, sonographer—can employ the data to support screening and refute detractors. The summaries were written by members of the first class of the SBI Breast Screening Leadership Group and reviewed and edited by the instructors. For a complete description of the Group, its inception, and its members, please see the article written by Debra Monticciolo, MD, F ACR, FSBI, in the third issue of the 2015 newsletter. Visit https://www.sbi-online.org/RESOURCES/BreastScreeningLeadershipGroupResources.aspx to find the archived articles on the website.

Limitations of the 2016 United States Preventive Services Task Force Guidelines for Breast Cancer Screening

By Elizabeth K. Arleo, MD; Bethany Niell, MD, PhD; Jessica Leung, MD, F ACR, FSBI; the Screening Leadership Group

Annual screening mammography starting at age 40 years and continuing for as long as a woman is in good health is the current recommendation of the Society of Breast Imaging, American College of Radiology, American Congress of Obstetricians and Gynecologists, and National Comprehensive Cancer Network. Numerous professional organizations maintain this recommendation because multiple scientific studies have demonstrated a 20% to 49% mortality reduction from breast cancer in women who are invited to have or actually have screening mammograms, compared with women who do not.1-5

In contrast, the January 2016 recommendation of the US Preventive Services Task Force (USPSTF) is “biennial (every 2 years) screening mammography for women aged 50 to 74 years. (B recommendation). The decision to start screening mammography in women prior to age 50 years should be an individual one. Women who place a higher value on the potential benefit than the potential harms may choose to begin biennial screening between the ages of 40 and 49 years. (C recommendation).” The USPSTF concludes “that the current evidence is insufficient to assess the balance of benefits and harms of screening mammography in women aged 75 years or older. (I statement).”6

The 2016 USPSTF recommendations remain unchanged from the 2009 USPSTF guidelines. However, the implications of the recommendations differ. Under the Affordable Care Act of 2010, insurance companies are required to cover services that receive a B rating or above by the USPSTF.7 This means
that under the 2016 USPSTF recommendations, private insurers will cover biennial screening of women 50 to 74 years of age. However, their C recommendation means that women aged 40 to 49 years who choose to undergo mammography screening and women aged 50 to 74 years who want to be screened annually may not be guaranteed coverage. This may particularly affect women on the lower end of the socioeconomic scale. Congress recently enacted the Consolidated Appropriations Act, which included language from the Protecting Access to Lifesaving Screenings Act. This will delay implementation of the USPSTF recommendations for 2 years, thereby allowing women continued access to screening mammography in the interim.

There are multiple additional issues with the 2016 USPSTF recommendations. Most importantly, based on recent modeling results, annual screening mammography of women aged 40 to 79 years results in a 37% reduction in breast cancer mortality, whereas biennial screening of women aged 50 to 79 years results in only a 26% reduction. Given these numbers, how could the Task Force conclude “with moderate certainty that the net benefit of screening mammography in the general population of women aged 40 to 49 years, while positive, is small”? The answer lies in their conservative systematic evidence review, which relies only on randomized controlled trials for the measure of benefit, modeling results, and qualitative approach to risk-benefit analysis. Although “the USPSTF found adequate evidence that mammography screening reduces breast cancer mortality in women aged 40 to 74 years,” they also “found adequate evidence that screening for breast cancer with mammography results in harms for women aged 40 to 74 years.”

The “harms” include overdiagnosis, false positives with the associated psychological harm of anxiety, and the potential harm of developing a fatal breast cancer induced by the radiation associated with screening mammography. Before addressing each harm below, it is important to point out that the Task Force failed to take into account that earlier detection and treatment of breast cancers results not only in decreased breast cancer deaths but also in decreased treatment-related morbidity (ie, fewer mastectomies and less frequent and less toxic chemotherapy). Admittedly, these morbidity outcomes are more difficult to quantify, and mortality outcomes have been the customary outcome used in guideline development. However, given the annual incidence of breast cancer and the associated morbidity associated with treatment for advanced disease, it is worthwhile to highlight this historic neglect of an important dimension of quality of life in women who do and do not die from their advanced-stage disease. It is also important to point out that overdiagnosis, false positives, and false negatives are a risk of all screening tests. None is unique to screening mammography.

Overdiagnosis is defined as a diagnosis by screening of a cancer that never would have become symptomatic in the woman’s lifetime or never would have been detected if screening had not taken place. Overdiagnosis is thought to be mostly attributed to ductal carcinoma in situ (DCIS); nonprogressive invasive disease is exceedingly rare. The extent of overdiagnosis remains unknown, and even the USPSTF acknowledged that “methods for estimating overdiagnosis at a population level are not well established.” Because of the “lack of consensus concerning the optimal method for calculating
Limitations of the 2016 United States Preventive Services Task Force Guidelines for Breast Cancer Screening, continued from previous page

the magnitude of overdiagnosis,* the USPSTF acknowledged a very wide range of estimates in the available literature (0% to 54%) but emphasized an estimate of approximately 20%.6,12 The USPSTF estimate of overdiagnosis included DCIS, resulting in a high rate. Assuming a higher frequency of overdiagnosis, as USPSTF did, maximizes the harms and therefore minimizes the benefit to risk ratio of screening mammography. The take-home message for the breast imager reading this column is that the estimated rate of overdiagnosis of invasive cancers is based on flawed assumptions. The actual frequency of overdiagnosis remains unknown, but it is probably less than 10% and mostly from DCIS.13

Irrespective of the frequency of overdiagnosis, an “overdiagnosed“ cancer will persist on imaging regardless of screening interval or age at initial screening. In other words, increasing screening interval (from annual to biennial) and starting at a later age will only delay the timing of overdiagnosis and will have no effect on decreasing the degree of overdiagnosis. Hence the element of overdiagnosis should not be used to determine when to start screening or how often to screen.

A false positive is a test result, such as a biopsy, that indicates the presence of cancer when cancer is not present. The USPSTF has expanded the definition of a false positive to include every screening study in which a patient is recalled for additional evaluation where cancer is not subsequently diagnosed, whereas the Mammography Quality Standards Act considers recalls to be incomplete rather than falsely positive. As breast imagers, we know that nearly 60% of women who are recalled from screening mammography only require additional imaging evaluation. In most cases, the additional imaging means a few mammographic images and possibly an ultrasound. Only a small fraction of recalled women will be recommended to undergo a minimally invasive in-office biopsy. Although the Task Force emphasizes the harms of recalls, studies have shown that women of all ages are willing to tolerate far higher recall rates than actually occur in clinical practice.14,15

A false-negative mammogram is defined as one interpreted as normal (negative or benign) although the patient is diagnosed with breast cancer before the next screening round. Like overdiagnosis and false positives, the risk of a false negative is a risk of any screening test, including but not exclusive to screening mammography. Based on Breast Cancer Surveillance Consortium data on mammography screening, a woman aged 40 to 49 years undergoing annual screening will encounter a false-negative examination once every 1000 years, whereas a woman aged 70 to 79 years will encounter a false-negative screen once every 667 years.16,17

The 2016 Task Force recommendations also state that “…radiation-induced breast cancer and resulting death can also occur, although the number of both of these events is predicted to be low.”6 Radiation risk for the breast is related to the age at exposure. Almost everyone agrees that the radiation risk for women aged 40 years and over from a mammogram is unmeasurable. Data provided to the USPSTF following a systematic review of the evidence suggest that at most, 2 to 11 deaths due to radiation-induced cancer may occur per 100,000 women screened.12 The estimated risk based on extrapolated data is tiny compared with the number of lives saved by screening mammography.
The 2016 USPSTF recommendations for breast cancer screening emphasize the risks of screening mammography while minimizing its benefits. The USPSTF 2016 recommendations for breast cancer screening are also discordant with the recently updated 2015 American Cancer Society recommendations (which were formulated with transparency, consistency, and scientific rigor as per the Institute of Medicine standards).

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The setting for the second World Congress on Controversies in Breast Cancer (CoBrCa) was a hotel conference venue along the Avenue Diagonal that bisects Barcelona, Spain. The mood was animated and high in energy from Thursday evening to Sunday morning (September 8-11, 2016). The 450 participants, including the faculty, chairing committee, abstract presenters, and attendees, represented 58 countries. The chairing committee was pleased with the outcome of the second CoBrCa, reported Ilana Rabinoff-Sofer, Director of Marketing of CongressMed, which runs the congress as well as similar ones in other medical and scientific fields. In chatting with other participants between sessions, I explored why they enjoyed the conference and confirmed several of the reasons why I did.

Most of the sessions were constructed as 30-minute debate blocks, each centered on a “controversial topic” in our multidisciplinary field of breast cancer management. These were just some of the topics: whether to use neoadjuvant chemotherapy for all operable cancers larger than 2 cm, whether all patients with hormone receptor–positive cancers should receive 10 years of endocrine therapy, utility of preoperative breast magnetic resonance imaging (an essential tool or an unnecessary luxury), whether screening-detected ductal carcinoma in situ (DCIS) is important, whether adjuvant radiation therapy after breast conservation surgery for DCIS is overtreatment, whether size (or margins!) still matter, and whether bilateral mastectomy rates are due to fear and ignorance.

The debating speakers had 10 minutes each to present their assigned “yes” or “no” perspective, followed by 10 minutes for rebuttal and a question-and-answer period. Speakers were cordial, and ribbing was allowed. Audience members voted on the topic before and after the debate. If you enjoy multidisciplinary tumor board conferences, then you will likely enjoy CoBrCa. It’s akin to a high-octane tumor board using a problem-focused debate format to stimulate your brain and leave you feeling enlightened. Even more fun, this format helps you get to know the speakers better too! I enjoyed the personalities and the accents reflecting the speakers’ origins from around the world.

CoBrCa co-chair and Professor of Surgery from Melbourne, Australia, Bruce Mann, MBBS, PhD, FRACS, feels affirmed in the congress’ aims. “We expected that the ‘controversies’ format and the focus on issues facing breast cancer clinicians would be well received, but the extent to which this happened surprised us. The mix of plenary sessions—addressing areas involving multiple clinical disciplines—and parallel sessions—where we delved more deeply into controversies within particular disciplines—has worked well and is something that we will develop further.”
The Second World Congress on Controversies in Breast Cancer, Barcelona, Spain, continued from previous page

The Chief Operation Officer at CongressMed, Nisan Bartov, explained the history of how he envisioned this congress to be unique among all the breast cancer conferences. He successfully pitched this congress to Professor Mann, who subsequently recruited the other co-chairs. This international team sees a bright future for and further growth of CoBrCa. Mr Bartov added, “We are pleased to be taking the CoBrCa meeting to Tokyo, Japan, in 2017. The regional differences in the discussions that occurred in Australia [CoBrCa 2015] and Spain [2016] have been interesting, and we anticipate that having a more pronounced Asian perspective in many of the discussions will be an added benefit.” Dates are to be announced soon.

Professor Mann and CoBrCa welcome more radiologists’ attendance. I was 1 of 3 in the entire congress. “We have included some topics of relevance to radiologists in both meetings so far, with a prominent session on screening in 2015 and an additional dedicated session on imaging in 2016. We will continue to include sessions attractive to radiologists in the Tokyo meeting and are investigating the possibility of extra sessions. The proliferation of imaging technology means that controversies abound!”

The goals should be—and are—to enable cross-education between specialists. Many of us breast imagers attend plenty of breast-specific continuing medical education meetings. The appeal of CoBrCa is the high-level conversation about medical oncology, surgical management, radiation oncology, and other medical specialties that partner with our role as breast imagers. This conference provides an opportunity to be part of the broader conversation and introspection that we as breast imaging specialists can respectfully and collegially bring to bear. This is also our chance to ask questions, some of which may seem basic, but in this venue there should be no “dumb” questions. Any collaborative and proactive education that keeps us moving and keeps us caring for our patients together can be a good thing. The international participation makes this congress especially jovial and, in my mind, grounded. The reminders that illustrate how much we cannot assume about our patients and our practice environments add extra dimensions to this congress experience that provoke thought in meaningful ways. I am already looking forward to the next one! For more information visit http://congressmed.com/cobrca/ or follow on Twitter @CoBrCaCongress.
In 2016, a 73-year-old woman presents for a bilateral digital screening mammogram (Figure 1). A mammogram in 2012 was normal. Recent laboratory test results, including complete blood count, were within normal limits. She denies any breast symptoms, fever, or weight loss. She did report night sweats during a recent trip to Eastern Europe. How would you interpret this mammogram?

**Figure 1.** Craniocaudal and mediolateral oblique views of a bilateral screening mammogram demonstrate heterogeneously dense breasts with bilateral axillary adenopathy. No breast masses, calcifications, or other suspicious findings are noted. This examination was assigned BI-RADS category 0 to prompt further workup of adenopathy.

*Interesting Case: Evaluation of Isolated Lymphadenopathy on Mammography*

By Preethi Raghu, MD; Marie Lee, MD, FACR; Timothy Jacobs, MD
**Interesting Case: Evaluation of Isolated Lymphadenopathy on Mammography, continued from previous page**

The patient has no significant past medical history. She has a past surgical history of total abdominal hysterectomy and bilateral salpingo-oophorectomy for uterine fibroids. Her regular medications include trazodone and losartan. She has no personal or family history of malignancy.

Because of the bilateral axillary lymphadenopathy on the mammogram, the patient returned for an ultrasound. The ultrasound demonstrated bilateral symmetric axillary lymphadenopathy, corroborating the mammographic findings. A BI-RADS category 4 was assigned. Percutaneous core biopsy samples of 2 contiguous enlarged axillary lymph nodes were obtained in the radiology department (Figure 2).

![Figure 2. Ultrasound image of right axillary lymphadenopathy demonstrates diffuse enlargement and cortical thickening. Lymph nodes otherwise maintain normal echotexture, reniform shape, and fatty hila.](image-url)
Interesting Case: Evaluation of Isolated Lymphadenopathy on Mammography, continued from previous page

Biopsy results demonstrated grade 1-2 (out of 3) follicular low-grade lymphoma with a nodular pattern of growth, a new diagnosis for this patient (Figure 3). The patient was then referred to the hematology/oncology department for further workup.

Figure 3. Hematoxylin and eosin staining demonstrates a nodular pattern of growth (top left). Markedly positive Bcl-2 staining (top right) and CD20 positivity (bottom left) are diagnostic markers consistent with follicular lymphoma. Ki-67 marker for proliferation demonstrated staining of 5% to 10% of nuclei, consistent with low-grade lymphoma (bottom right).
Interesting Case: Evaluation of Isolated Lymphadenopathy on Mammography, continued from previous page

Staging computed tomography of the neck, chest, abdomen, and pelvis showed systemic lymphadenopathy, consistent with stage III follicular lymphoma (Figure 4).

Figure 4. Computed tomography images of the neck, chest, abdomen, and pelvis demonstrate widespread systemic lymphadenopathy in the left inferior cervical chain (top left), porta hepatis (top right), left axilla (bottom left), and peri-aortic (bottom right) locations, consistent with stage III follicular lymphoma.

This case is an excellent example of the diagnostic considerations involved in the evaluation of isolated lymphadenopathy on breast imaging.¹

First, the lymphadenopathy must be characterized.²⁻⁴ Is it unilateral or bilateral? Is there lymphadenopathy elsewhere? Are there any associated symptoms? Is there known malignancy or infection? What is the patient’s human immunodeficiency virus (HIV) infection status? What are the patient’s other known medical conditions and medications?

Second, the broad differentials for isolated axillary adenopathy must be carefully taken into consideration. Unilateral axillary lymphadenopathy may be due to occult breast cancer, lymphoma,
metastatic malignancy, infections (such as cat scratch disease, mastitis, or abscess), or recent immunizations.\textsuperscript{5,6} Bilateral axillary lymphadenopathy can be suggestive of systemic diseases such as HIV-related lymphadenopathy, lymphoma, leukemia, metastatic malignancy, collagen vascular disease, psoriasis, sarcoidosis, and systemic lupus erythematosus.\textsuperscript{5-7}

Discussion with colleagues in the pathology department prior to biopsy can help guide appropriate specimen collection. If lymphoma is suspected, surgical biopsy or excision is not necessarily required. Radiologists can perform a core biopsy or fine-needle aspirate with 2 samples—1 specifically designated for flow cytometry—to evaluate for lymphoma. Core biopsy is preferred because of the larger sample size. Ideally, the flow cytometry sample should be placed in a special medium known as RPMI (Roswell Park Memorial Institute medium) and delivered to the pathology department. However, if RPMI is not readily available, it is also acceptable to place samples in saline and send them to the pathology department within 1 hour.

Finally, the patient should be referred for appropriate medical and/or surgical interventions based on biopsy results. Since our patient was asymptomatic and had normal bloodwork results, surveillance was favored over treatment for her low-grade follicular lymphoma. However, she continued follow-up with the hematology/oncology department to monitor for Richter transformation into a more aggressive B-cell lymphoma.

Ultimately, although this is a rare result and not breast cancer, the screening mammogram and the radiology team were instrumental in detecting, investigating, and ultimately diagnosing lymphoma.

REFERENCES
Elastography: The Next Wave in Breast Imaging

By Robert M. Nishikawa, PhD, FAAPM, FSBI, FAIMBE; Karem Daiane Marcomini, MSc; Eduardo de Faria Castro Fleury, MD

Whether as a complement to mammography for evaluating breast masses or for screening women with dense breast tissue, breast ultrasound is an invaluable tool in breast imaging. While ultrasound can be more sensitive than mammography for detecting invasive breast cancer, its specificity is generally lower. One approach to improving specificity is to measure lesion elasticity using ultrasound elastography.

Elastography relies on the same physical principles as palpation to detect a breast mass. When applying force to the breast, the internal tissue deforms depending on its compressibility. Relative to normal breast tissue, benign lesions are less deformable, or stiffer, and malignancies generally exhibit a stiffness that exceeds that of normal and benign tissues. In the physics world, we measure stiffness in terms of Young’s modulus, which is a measure of elasticity. The ratio of the amount of compression applied (ie, stress) to the amount of tissue deformation (ie, strain) is the elasticity. Elasticity is measured in units of pressure, usually kilopascals (kPa).

Elastography measures elasticity and provides complementary information to the anatomical characterization created by B-mode ultrasound and mammography. Elastography measures elasticity by 1 of 2 methods: strain (compression-based elastography) or shear-wave elastography (SWE).

Strain elastography uses the pressure of the probe in a gentle, repetitive compression. The technique is sensitive enough that it can rely on pressure from breathing or the heartbeat to produce a deformation in the tissue. In either case, since the amount of pressure applied is unknown, only relative measures are obtained. Software analyzes the frame-to-frame difference in deformation to determine the stiffness of a lesion relative to the surrounding normal tissue. This information is displayed on the B-mode image, often in color (Figure 1).

In SWE, the transducer produces a “push pulse” that generates a shear wave in the tissue. The velocity of the wave depends on the speed of sound through the tissue, which in turn is dependent on the tissue stiffness (ie, the elasticity is proportional to the tissue velocity squared). A quantitative value of stiffness is then displayed on the B-mode image in color in real time, with different colors corresponding to different values of elasticity measured in kPa (Figure 2). Higher velocity indicates stiffer tissue. Typical elasticity for malignant lesions is >100 kPa, benign tissue is <80 kPa, dense parenchyma is
Elastography: The Next Wave in Breast Imaging, continued from previous page

45 kPa, adipose tissue is 3 kPa, and simple cyst is 0 kPa. There is, however, overlap in elasticity values for different tissues. The optimal threshold to distinguish benign and malignant lesions, and thereby improve specificity, has not yet been agreed upon, although a value of 50 kPa has been proposed.

Either method displays higher elasticity values in red and lower values in blue, although this color coding can vary between ultrasound vendors. Further, elastography units have a mirror function that allows for viewing the lesion simultaneously in the B-mode. This is important as another feature to separate benign from malignant findings. Malignant lesions tend to be larger in elastography than in the B-mode, whereas benign findings are the same on both tests. The effect is most likely due to peripheral desmoplastic reaction that is isoechoic to surrounding tissue on B-mode images and will cause adjacent tissue to be stiffer than normal.

Another technique to produce strain images or shear-wave images is acoustic radiation force impulse (ARFI). The type of image depends on how the pulse is generated and how the effect is
recorded. The ARFI method produces only static images, with the shear-wave method measured in terms of the velocity of the shear wave in meters per second. A typical cutoff between benign and malignant lesions is 3.59 m/s.

Multiple studies have shown ultrasound elastography to improve radiologists’ abilities to differentiate malignant from benign masses. As one might expect, malignant masses appear very heterogeneous and irregularly shaped, and they have high elasticity compared with benign masses, which are more homogeneous in color and have lower elasticity values. A review by the National Medical Policy summarizes many of the clinical studies that investigated ultrasound elastography.

Figure 2. Oval, mostly circumscribed mass considered to be a BI-RADS 4a in a 35-year-old woman. The shear-wave elastography image shows a homogeneous stiffness with a maximum color of dark blue (soft, per this particular ultrasound vendor). The maximum elasticity was 51 kPa, indicative of a benign lesion. Percutaneous core biopsy showed a fibroadenoma. Courtesy of Joël Gay, SuperSonic Imagine.
Elastography: The Next Wave in Breast Imaging, continued from previous page

The largest study to date has been reported by Berg et al. The authors supplemented standard breast ultrasound with SWE in 958 women recruited from 16 centers across the United States and Europe. For 939 analyzable masses, B-mode had an area under the curve (AUC) of 0.950, with a sensitivity of 97.2% and a specificity of 61.1%. With the addition of SWE, there were statistically nonsignificant changes in AUC (0.959) and sensitivity (97.2%) but a statistically significant increase in specificity (77.4%, \( P < .001 \)). Of 650 benign lesions, 106 were downgraded from Breast Imaging Reporting and Data System (BI-RADS) category 4 to BI-RADS 3 or 2. While this study is very promising, there are 2 main limitations. The first is that the elastography findings did not affect clinical treatment. The second limitation is possible selection bias; investigators selected women on the basis of their ultrasound examinations.

Other studies have examined the role of elastography in imaging women with triple-negative breast cancer, detecting residual breast cancer after neoadjuvant chemotherapy, imaging palpable masses, and evaluating complex cystic and solid breast masses. The technique shows promise in all these applications.

Like B-mode ultrasound, elastography is user dependent, and there is substantial inter-radiologist variability in its interpretation. The technique may also be less accurate for lesions deep in the breast.

A large, randomized, multi-institutional clinical trial to evaluate the role of elastography is needed to clearly define the benefits of adding elastography to B-mode ultrasound, and such a trial would be helpful before wide clinical acceptance is realized.

REFERENCE

Here is some reassuring news for aspiring breast imagers. According to the most recent 2015 American College of Radiology workforce survey, the subspecialty of breast imaging is projected to have the second most hires in all of radiology, following interventional radiology. Now for a realization: the job search during radiology training is a first for most and sets the stage for your future career. While your first job may not be forever, go after it with gusto. The following is my advice from lessons learned along the way to signing on for my first job after fellowship. Take it for what it is worth.

Think introspectively. Spend time reflecting on what type of job would make you happiest. If you can, quantify what certain lifestyle aspects are worth to you and prioritize your values with respect to work, life, and geography. Doing so ahead of time ensures that you can approach complex decision-making in a straightforward way, and you won’t be blinded by dollar signs.

Start early. Join online job boards to get a general sense of the job market in the subspecialty or your desired geographic locale. Consider signing up for career bulletins through the Society of Breast Imaging (http://rad.sbi.associationcareernetwork.com/Common/HomePage.aspx) and American College of Radiology career centers. Keep your search as general as possible in order to appreciate the range of job opportunities and avoid overfiltering (eg, if you choose only to see “breast imaging” jobs you may miss a better job listed as “women’s imaging”). The more you acquaint yourself with the radiology job market, the better you will be at gauging available jobs when the time comes.

Build a network and use it. Radiology is a small world. Networking is the best way to learn about jobs that are not advertised, especially if you are applying outside of your home network or in a competitive locale. The sooner you start to network the better, and it is not as difficult or painful as you may think. All it takes is an effort to get to know your colleagues. Take advantage of opportunities to meet and connect with other radiologists at conferences, society meetings, or alumni events. Reach out to former residents and fellows who are now in practice. Leveraging your network for jobs and contacts is a smart move during your search.

Be ready. Opportunity favors the prepared. Keep your curriculum vitae up-to-date and create a working cover letter. You never know when the perfect job posting might land in your inbox or a serendipitous introduction at a conference could open the door to future employment. Send your application materials promptly while everything is fresh in mind.

Prepare for your interview. Do the necessary legwork to research the practice ahead of time. Make a list of your questions but also make talking points about how you can add value and grow the practice. Rehearse the interview, focusing on content, tone, and posture. For private practice, familiarize yourself with the local health care market and services available (eg, tomosynthesis), as...
The First Job Search, continued from previous page

well as the practice members and structure. In academics, realize that you may be giving a talk or interviewing with nonradiology faculty and staff (eg, breast surgeons, oncologists, business administrators).

Put your best foot forward. The night before your interview, get plenty of sleep. The day of, dress professionally but comfortably. During your interview, be positive and ask more questions than you answer. Meet as many members of the practice as possible. Promote yourself when opportunities arise. After the interview, follow up promptly with a thank you, additional questions, or anything you may have promised.

Interview at more than one place. There is a litany of reasons why. You can sharpen your interviewing skills and expand your network. Even if the job doesn’t seem like a perfect fit from the outside, you may be pleasantly surprised. The experience of interviewing at multiple places can shed light on important positives or negatives that you may not have considered. Exploring your options will give you more peace of mind when it comes time to make a decision.

Analyze any offer. When you get an offer, the very first thing to do is celebrate, obviously! Next, find an attorney experienced with physician contracts in your future state of employment. Comparing offers is helpful and friends going through the process can be great resources. Then get ready to negotiate. You may hear that in competitive markets you have no negotiating power. In any market, it never hurts to ask (nicely). Do your power poses and read up on smart strategies in JACR. On a final note, get every agreement explicitly in writing up front.

Be grateful. Reach out again to those who helped you along the way to let them know where you will begin your career and what their support means to you. Don’t forget to pay it forward.

Good luck on the job hunt and enjoy the journey.

REFERENCES
Lessons from a Clinic Fire—Part 1

By Danna Grear, MD

At 11 PM on Friday, December 18, 2015, after a very busy week at The Breast Center of Northwest Arkansas in Fayetteville, my office manager, Sarah, called to inform me that smoke alarms were sounding at our clinic. Despite false alarms in the past, I was still concerned. “I’ll meet you at the clinic,” I told Sarah. As I approached, I was alarmed to see a smoky haze in the air surrounding the clinic.

Outside The Breast Center, we saw no flames. However, 5 fire engines surrounded the building, with booms overhanging the roof. Billows of smoke arose from several points on the roofline. In subfreezing temperatures, we watched as firefighters moved in and out of the building with hoses and other equipment. The fire marshal periodically updated us on the progress, informing us that the fire appeared to have started in the attic and was continuing to burn. The firefighters worked until after 1 AM to gain control. Shortly after 1, the fire marshal told us that the fire was contained and he would accompany us while we inspected the building. “It’s not a pretty sight,” he announced. However, the fire had spared the main floor of our clinic, and the firefighters had carefully covered our valuable equipment with waterproof tarps.

We were not prepared for what we saw with our flashlights in the powerless clinic. Although most of our mammography and ultrasound equipment was covered, the building was filled with smoke, and black ash covered our furniture, carpet, and computers. Acoustic tile, insulation, and lighting fixtures hung from the ceiling. It looked like a scene from a science fiction movie. We were thankful the firefighters had covered our imaging equipment since water was everywhere from battling the
Lessons from a Clinic Fire—Part 1, continued from previous page

fire in the attic space above. That night, as we wandered through our clinic, we shed some tears and wondered how long it would take for us to be practicing again.

Some of the furniture and computer systems were able to be salvaged. However, there was damage to every mammography machine, the entire building’s electrical system, and the breast magnetic resonance imaging (MRI) machine. Thankfully, our practice is part of Medical Associates of Northwest Arkansas (MANA), a physician-owned multispecialty group led by a team of highly skilled administrators. Our chief executive officer and chief financial officer were on site with us at the fire, and by 3 AM, we were in our chief executive officer’s office calling our insurance company and making plans for contacting our patients and rebuilding our clinic. On Saturday morning, our information technology department set up a temporary call center, and by noon, several of our employees had responded and were on site calling scheduled patients to inform them of the fire.

Our overriding concerns were how we would be able to provide services to our patients and how we could keep our staff employed. We immediately prioritized and shifted patients to our smaller satellite clinic approximately 20 miles away, opening our schedule at that site from 7 AM to 7 PM and on Saturdays. Our ancillary staff was relocated off site, and our clinical staff covered the extended hours at this single site. All of our employees continued to be paid for their regular hours but were scaled back to approximately 60% of their usual work time.

Our team began a search for a building we could rent, renovate, and temporarily occupy. By March of 2016 we began moving into a temporary location, and by April we were operating at full capacity. Through our contacts at Hologic, we were connected with Dr Alex Sardina, the chief medical officer of Covia Health, an organization headquartered in Houston, Texas, that provides mobile 3D mammography. We agreed to lease one of their new, beautifully appointed mobile suites to serve our patients during our interim period.
Lessons from a Clinic Fire—Part 1, continued from previous page

Over the days and weeks that followed, there were many lessons to be learned:

1. Tough firefighters are some of the most sensitive and kind people you will ever meet.
2. A good insurance policy is a must, not only for coverage of building and contents but also for business interruptions. It allows physicians and staff to continue to be paid.
3. Insurance settlements take a long time.
4. A mediator is an invaluable asset. Our administrative team communicated directly with our insurance carrier. However, in several situations our independent broker stepped in to negotiate a difference in opinion. This allowed us to maintain a tough stance with our insurance company while preserving a good working relationship.
5. Moving imaging equipment is EXPENSIVE and complicated. Since we had no power to our building, the only way that our equipment could be accessed was to move it to a site where it could be installed and evaluated. Establishing whether the equipment had sustained damage was an important early step, but finding a building for relocation over the Christmas holidays was a challenge. In late January, at a cost of more than $5000 per machine, we moved and installed mammography equipment that, because of damage, would ultimately never be put back into use.
6. Digital detectors are sensitive to cold temperatures! Previously, we were aware that heat was an issue, but we never realized that they could not withstand extreme cold. In the end, our digital mammography detectors were mailed to Hologic headquarters for their final assessment, only to be determined that they were unrepairable.
7. Dedicated staff are worth their weight in gold.
8. It takes a village. Practicing outside of a hospital system is challenging. We could not have prevailed without our MANA team of professionals to help us. Additionally, we consulted with realtors, architects, builders, accountants, lawyers, and loyal vendors. Relationships are invaluable. Your friends will be there and will be happy to help.

Now in September of 2016, nine months later, we are still housed in a temporary location. Through extended hours, our temporary location, and mobile mammography and MRI, we have been able to catch up with our backlog and are offering all of the services that we did previously.

We have settled the majority of our insurance claim and are on schedule to move back into our newly remodeled building in November of 2016. Although the process has been rough, we are confident that our new facility will be the beginning of an even better practice.

Part 2 of this recovery process at the Breast Center of Northwest Arkansas, describing the return to the rebuilt clinic, will be featured in the next edition of the newsletter.
We should enroll in the National Mammography Database (NMD) to contribute to the database and to receive performance feedback. This applies to breast imaging practices of all types, academic and community, in various geographical locations. Only in this manner may we obtain true evidence-based data on performance measures. Such feedback will help each of us improve quality and ensure better patient care. This assessment is also important for financial considerations in the era of pay-for-performance measures.

The American College of Radiology (ACR) oversees the NMD. There are 3 major technical components to participation: enrollment, data submission (initial and ongoing), and receipt of performance feedback data.

To join the NMD, one must first obtain a facility number with the ACR National Radiology Data Registry (NRDR). The NRDR is a web-based platform of imaging registries. There needs to be a signed NRDR Participation Agreement, which is a business agreement and a legal document. Applicants then choose a specific database within the NRDR, in this case the NMD. Once a registration number is obtained, one can log onto the specific database for the NMD:

https://nrdr.acr.org/Portal/NMD/Main/page.aspx

Upon registration with the NRDR, a Facility Administrator should be identified. This individual will be responsible for all communication and “paperwork” aspects of registry participation. A facility may be defined as a hospital, outpatient clinic, freestanding center, academic site, or other imaging site. If there are multiple locations in one group, a multicenter registration process may be employed with identification of a master facility.

There is a fee to participate in the NMD, but it is waived if the center is accredited as an ACR Breast Imaging Center of Excellence. To submit data and to obtain information about the fee structure, please refer to the following website:


Each facility uploads data to the NMD via the website. Of note, many of the data to be submitted are already collected for the purpose of accreditation by federal mandate of the Mammography Quality Standards Act. The numerous required specific data elements are detailed in the following table:

How to Get Started With the National Mammography Databas,
continued from previous page

Currently, there are 2 NMD versions: 2.0 and 3.0. The 2.0 version corresponds with BI-RADS 4th Edition (2003), and the 3.0 version corresponds with BI-RADS 5th Edition (2013). Although the earlier version is still accepted, it is expected to be phased out in the near future. Therefore, it is encouraged that facilities either start by submitting data to NMD 3.0 or transition from NMD 2.0 to NMD 3.0.

Given that data are contributed online, it is important to work with your Radiology Information System (RIS) vendor during enrollment and data submission. To facilitate this process, the NMD certifies software companies as being compatible. There is only one NMD-certified software partner for NMD 3.0 at this time: Medical Reporting Software (MRS). Several other software programs are approved for NMD 2.0: Candelis, Epic, General Electric, Insight, Jambeyang Research, MagView, Merge, MRS, PenRad, Siemens, and Swearingen. Alternatively, in the absence of a NMD-compatible RIS vendor, an Excel spreadsheet file may be converted to an NMD-compatible format and uploaded to the NMD website. One important consideration is the collection and submission of modality-specific versus cross-modality data (integrated between mammography and ultrasound).

Semiannual reports are generated to compare facility data with aggregate data collected from all NMD sites. These reports allow each facility to assess itself against real-life contemporary data from similar practices in this country. Data on cancer detection, positive predictive value, and recall rates are provided. Comparative analysis will be broken down by physician, facility, and physician group. At this time, national benchmarks are being provided by the Breast Cancer Surveillance Consortium (funded by the National Cancer Institute) at the facility level.

As an extra benefit, participation in the NMD registry satisfies the criteria for practice quality improvement as per the American Board of Radiology (ABR) and counts toward satisfying criteria in the ABR Maintenance of Certification Program.1

Numerous exciting research opportunities are possible through the NMD.2 Such clinical outcomes research will provide an evidence-based approach to everyday clinical issues, with a significant impact on patient care. Interested individuals may contact the NMD Committee to request data. Research using NMD data will be further discussed in a future SBI article.

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Common Problems with the Mediolateral Oblique: How to Help Your Technologist

Part 1 – The Inframammary Fold: How to Improve Visualization and Reduce Skin/Fat Folds in the Inframammary Fold

By Louise C. Miller, RTRM

This is the first of a 3-part article on how to provide feedback to your technologists regarding solutions to common positioning problems.

Please note that regardless of the experience and expertise of the technologist, the “perfect” image cannot be produced 100% of the time. Remember the last time you were selecting images for American College of Radiology accreditation? I am sure, like most radiologists, you reviewed seemingly hundreds of images to find the “perfect” case for submission. Even so, we all are a bit anxious waiting for the results. When the data regarding positioning criteria were published in 1993,¹ the authors stated that even after receiving hands-on, standardized positioning training for acquiring a mediolateral oblique (MLO), visualization of the inframammary fold (IMF) was obtainable only 49% of the time. This outcome was largely due to variations in body habitus and other patient issues. Interestingly, there have been no published articles with current data considering the change in image receptor (IR) and face shield width and length, thus making positioning the MLO even more challenging. Data recently collected by an academic breast imaging department, but not yet published, demonstrate that updated standardized techniques significantly increase visualization of the IMF. The remainder of this article will discuss specific methods to improve IMF imaging.

Figure 1. Proper positioning is achieved by lifting the breast and bringing the IMF (arrow) onto the image receptor. The dashed line indicates the edge of the IR. Source: Mammography Positioning Guidebook, by Louise Miller, RTRM. Reprinted with the permission of the author.

Figure 2. Horizontal fold is in the medial breast (1). Vertical fold is in the lateral breast (2). Source: Mammography Positioning Guidebook, by Louise Miller, RTRM. Reprinted with the permission of the author.
Common Problems with the Mediolateral Oblique: How to Help Your Technologist, continued from previous page

Methods for Increasing Visualization of the IMF

The position of the patient relative to the bottom front corner of the IR is critical (Figure 1):

- The patient must be facing forward, towards the mammography machine.
- The lower front corner of the IR should be directly below the patient’s nipple and halfway between her anterior-superior iliac spine and umbilicus.
- This positioning requires the patient to step towards the technologist, who should be standing at the medial side of the breast to be imaged.

Methods for Reducing Skin Folds in the IMF

Bassett’s study showed that skin and fat folds were present on approximately 15% of MLO images. Skin folds were more prominent on full-field digital mammography (FFDM) because of the digital algorithm and increased width of the IR. It is virtually impossible to exclude all skin and fat folds on every image. It is interesting to note that following updated standardized positioning training for FFDM and digital breast tomosynthesis (DBT), which includes increased visualization of posterior breast tissue, the number of skin and fat folds increased.

Horizontal folds in the IMF usually occur in the medial breast and are difficult for the technologist to see when positioning the patient (Figure 2). Corrective actions can include the following:

- Make sure that the breast is held in the up-and-out position.
- The up-and-out position should be maintained until compression is complete.
- Have the patient lift her contralateral breast up and back without pulling ipsilateral breast tissue out from under the compression paddle.

Vertical folds in the IMF usually occur in the lateral side of the breast and are difficult for technologists to see when positioning the patient as that area of the breast is hidden from view by the IR. Corrective action can include the following:

- Make sure to smooth lateral and inferior breast tissue before lifting the breast up and out from the chest wall.
- Check for position of the IMF (see above). Pulling too much lateral breast tissue in front of the IR will cause additional folds in this area.

REFERENCE

Highlights of the European Society of Breast Imaging Meeting, 2016

By Jean Seely, MD, FRCPC

The fifth annual Scientific Meeting of the European Society of Breast Imaging (EUSOBI) was held in Paris on September 23-24, 2016. It was organized with the cooperation of the French Society of Women’s Imaging at the Cité des Sciences et de l’Industrie, on a scenic location on a canal near the Seine River. Approximately 670 individuals registered for the meeting.

The conference began with Dr Sylvia Heywang-Köbrunner (Munich, Germany) delivering a beautiful review of the history of and her role in 30 years of breast magnetic resonance imaging (MRI) research, for which she was awarded the EUSOBI Gold Medal.

The first scientific session was on neoadjuvant chemotherapy. Anne Vincent-Salomon, MD, PhD, (Paris, France) focused on standardization of the definition of pathological complete response and the role of the radiologist in determining sites of residual disease. Claudette Loo, MD, (Amsterdam, the Netherlands) reviewed MRI as an imaging biomarker of response evaluation of breast cancer treatment and the importance of showing treatment responses among different breast cancer subtypes that may lead to tailored treatment and improved prognostic outcomes. Dr Peter Dubsky (Lucerne, Switzerland) discussed surgery after preoperative chemotherapy.

Corinne Balleyguier, MD, PhD, (Villejuif, France) organized a Breast Imaging Reporting and Data System workshop using clinical cases in mammography. Cases in MRI were presented by Dr Karen Kinkel (Chêne-Bougeries, Switzerland) and ultrasound cases by Dr Michael Fuchsjäger (Graz, Austria). A session on breast imaging in Israel was presented by Tamar Sella, MD (Jerusalem), focusing on screening, and by Dr Miri Sklair-Levy (Ramat Gan), discussing the contributions of Israeli technology to breast cancer imaging.

The second scientific session was on MRI. Pascal Baltzer, MD, (Vienna, Austria) presented results of his survey of breast MRI use in Europe, observing geographical differences with greater use of MRI in southern than in northern Europe. Dr Francesco Sardanelli (Milan, Italy) presented initial results from the Multicenter International Prospective Meta-Analysis, which compared preoperative MRI with no MRI. He noted that the surgical plan to perform mastectomy was made after conventional imaging and before MRI for 20% of patients. After an MRI, which was ordered by surgeons in 40% of cases, the mastectomy rate rose by only 1%, leading him to conclude that the decision to treat with mastectomy prompted the MRI and not the reverse. Next, Christiane Kuhl, MD, (Aachen, Germany) gave a thought-provoking lecture on the evidence for and against breast MRI, focusing on the importance of using diagnostic accuracy. She suggested that the value of MRI...
should not be based on downstream outcomes but rather upstream diagnostic information. Dr Fiona Gilbert (Cambridge, United Kingdom) spoke on the topic of gadolinium deposits in the brain and implications for our patients. She referred to a 2015 editorial in *Radiology* by Emanuel Kanal, MD, FACR, and Michael Tweedle, PhD, recommending that radiologists take the lead in MRI contrast media use.¹

In an industry-sponsored symposium, Suzette Delaloge, MD, (Paris, France) discussed proper risk evaluation and stratified screening. Nancy Cappello, PhD (New York), of AreYouDense.org, delivered a passionate speech on her perspective as a patient regarding individual breast cancer risk and personalized screening.

Diffusion MRI was the topic of the third scientific session, which included the underlying basic science and clinical applications of diffusion-weighted imaging (DWI) and diffusion tensor imaging (DTI) and methods of measuring diffusion images. Beautiful images were shown of what is possible with high-quality DWI and DTI, which depend on a well-tuned MRI with high signal to noise ratio.

The second day of the meeting began with an interactive multidisciplinary tumor session with a complete panel including an oncologist, surgeon, pathologist, radiologist, and radiation oncologist. The audience was encouraged to participate through electronic responses to management questions. This was followed by the keynote lecture, delivered by Hedvig Hricak, MD, PhD, FACR (New York). She discussed oncological imaging in clinical decision-making, emphasizing that new molecular imaging, postprocessing, and computational modeling tools will enable radiologists to become even more valued clinical consultants than ever before.

A session on screening was very well attended. First, Patrice Heid (Marseille, France) reviewed the European quality control for digital breast tomosynthesis (DBT). In April 2015, the European Reference Organisation for Quality Assured Breast Screening and Diagnostic Services published a tomosynthesis quality control protocol (http://www.euref.org). Mr Heid studied the 5 DBT systems available and found large differences in terms of dose and image quality. This may be indicative of clinical performance. Next, there was a debate of best ways to screen, with Ruud Pijnappel, MD, PhD, (Utrecht, the Netherlands) covering screening with mammography only; Thomas Helbich, MD (Vienna, Austria), supplemental screening with ultrasound; and Dr Gilbert, DBT and 2D mammography. The speakers all concluded that screening with mammography was the only method that was clinically and cost effective with evidence of improved long-term outcomes.

Saturday afternoon the President of the SBI, our own Liz Morris, MD, FACR, FSBI, took the stage at the EUSOBI meeting to discuss metastatic cancer radio(geno)mics. She showed that despite considerable decrease in breast cancer mortality in the past few decades, 25% to 30% of women with early-stage breast cancer still die of metastatic breast cancer. She described the possibility of detecting cell-free circulating tumor DNA in the bloodstream as a screening tool for cancer. This has been made possible by the sequencing of the human genome. She suggested that images
could be studied and correlated to genomic patterns of tumor types, thereby using radiology to predict biology and outcome. We are challenged to predict tumor biology, which can be independent of tumor size. Rapidly metastatic small cancers are more dangerous than large nonmetastatic tumors.

Cutting-edge breast imaging techniques were presented by Katja Pinker-Domenig, MD, (New York) on biomarker imaging with ultrahigh-field MRI and positron emission tomography MRI; by Willi Kalender, PhD, (Erlangen, Germany) on high-resolution photon-counting breast computed tomography at low dose; and by Dr Josefine Reber (Munich, Germany) on optoacoustic imaging using a handheld breast ultrasound.

For the first time, the EUSOBI meeting included a scientific program with poster sessions from Europe, the United Kingdom, Israel, New Zealand, Brazil, Hong Kong, Canada, and the United States. The posters were presented during breaks in the morning and midday, which was a positive, interactive part of the conference.

The meeting concluded with a Breast Interpretation Quiz pitting France against the rest of Europe. The conference offered many opportunities to promote international exchanges and encourage innovation in research. This better serves breast imaging and helps to improve the health of women all over the world. The next EUSOBI meeting will be held in Berlin on September 22-23, 2017. Visit http://www.eusobi.org/cms/website.php for more information.

REFERENCE

After almost 3 years of planning, development, and review by the National Cancer Institute, the ECOG-ACRIN abbreviated breast magnetic resonance imaging (AB-MR) trial is now activated. The expanding adoption of breast density legislation nationally has resulted in a dramatic proliferation of combined screening with mammography and whole-breast ultrasound. However, because of the shortcomings of this approach, our team set out to evaluate AB-MR as a more accurate and cost-effective method to screen women with dense breasts. The concept of an AB-MR is a shortened MRI with a cost similar to combined screening with mammography and whole-breast ultrasound but with higher sensitivity, higher specificity, and fewer short-term follow-ups. This trial, which is a phase II study comparing the cancer detection rates of AB-MR and digital breast tomosynthesis (DBT), represents the first step in evaluating AB-MR as a potential tool for screening women with dense breasts.

**Title:** Comparison of Abbreviated Breast MRI and Digital Breast Tomosynthesis in Breast Cancer Screening in Women with Dense Breasts (EA1141)

**Principal investigators:** Christopher Comstock, MD; Christiane Kuhl, MD; and Gillian Newstead, MD

**Primary aim:** To compare the rates of detection of invasive cancers between the initial AB-MR and DBT

**Eligibility (see protocol for complete list):**
- Patients are women aged 40 to 75 years scheduled for routine screening DBT.
- Patients must have mammographically dense breasts (American College of Radiology [ACR] Breast Imaging Reporting and Data System [BI-RADS] density categories 3 or 4) on their most recent screening mammogram.
- Patients must have never had breast MRI or contrast-enhanced digital mammography.
- Patients must not have undergone screening breast ultrasound within 12 months prior to enrollment.

**Study design (N = 1450 patients):**
- Paired design; all patients undergo both DBT and AB-MR on the same day at year 0 and year 1.
- DBT and AB-MR are read by 2 separate radiologists blinded to the results of the other test.
- After the year 1 DBT and AB-MR, patients return to their standard screening per site practice and are followed for breast cancer occurrence for 3 years.
ECOG-ACRIN Trial Evaluating Abbreviated Breast MRI Is Now Open!

continued from previous page

- For patients that consent to tissue submission, tissue from all cancers detected during the study period will be sent for genetic profiling per study protocol.

AB-MR defined as the following:

- Total scan time of less than 10 minutes, including a localizer, 1 pre- and 1 postcontrast gradient-echo axial acquisition, and an axial T2-weighted sequence with in-plane resolution matching the gradient-echo sequences. The center of the K-space should be between 60 and 90 seconds post contrast administration. Fat suppression is recommended if it is usual site practice. In-plane resolution should be ≤1 mm and slice thickness ≤3 mm.

Study costs:

- The cost of the baseline and year 1 AB-MR ($400 per scan) will be covered by the trial, as will costs for tissue submission and approximately $1000 per patient National Cancer Institute accrual credit.

Site qualification (National Clinical Trials Network and National Cancer Institute Community Oncology Research Program members), approximately 25 to 30 sites expected:

- AB-MR studies can be performed only on magnets accredited by the ACR for breast MRI.
- MultiHance (gadobenate dimeglumine; Bracco Diagnostic, Inc) gadolinium contrast agent is a protocol requirement (no substitutes allowed).
- Readers for the AB-MR studies must be accredited by the ACR in breast MRI.
- Readers must have performed the Society of Breast MRI AB-MR reader training, passed the AB-MR reader certification test, and provided their certification number.

If you are interested in participating in the study or for more information, please contact:

Christopher Comstock MD, FACR, FSBI
(email: ComstocC@mskcc.org)

Sharon Mallett: American College of Radiology Imaging Network Project Manager, Diagnostic Imaging Clinical Trials, 1818 Market St, Suite 1600, Philadelphia, PA 19103
(email: smallett@acr.org)

See also: http://ecog-acrin.org/clinical-trials/ea1141-educational-materials.
Breast imagers will be delighted to discover that the Radiological Society of North America (RSNA) offers a stimulating and engaging mix of special sessions, workshops, and lectures this year. These activities kick off Sunday morning with a breast imaging Science Session With Keynote address on multimodality screening and ultrasound diagnostics. This will be followed later that afternoon by a Biology of Breast Cancer session composed of 3 lectures, including “Breast Imaging for Improved Understanding of Genetic Risk and Cancer Biology,” delivered by Elizabeth S. Burnside, MD, MPH, FSBI.

On Monday afternoon, don’t miss the Special Interest Session “How Radiologists Can Improve Mammography Screening in the U.S.—Get Organized.” These lectures will cover the topics of improving adherence to screening, applying risk assessments, and assessing and improving mammography image interpretation. Robert A. Smith, PhD, FSBI, of the American Cancer Society (and previously featured in a “What I’ve Learned” article in the SBI newsletter), will introduce the session and join the speakers in a panel discussion at the conclusion of the lectures. This session will undoubtedly lead to an interesting and lively discussion of current issues faced by all breast imagers.

Tuesday afternoon includes a Science Session With Keynote address on contrast mammography/computed tomography as well as a late afternoon session on digital breast tomosynthesis (DBT). The session begins with “The Nuts and Bolts of DBT Technology,” presented by Stamatia V. Destounis, MD, FACR, FSBI, followed by “Implementing DBT Into Your Practice,” by Jocelyn A. Rapelyea, MD, FSBI, and concludes with “DBT-Directed Breast Biopsy,” by Liane E. Philpotts, MD, FACR, FSBI.

As part of Wednesday’s RSNA/European Society of Radiology Hybrid Imaging Symposium titled “Hybrid Imaging in the Female (An Interactive Session),” Osman Ratib, MD, PhD, will discuss how to interpret hybrid imaging examinations in the breast and explain the role of hybrid imaging in staging, treatment evaluation, and follow-up of breast cancer. Attendees hoping to learn more about the screening mammography controversy in the United States will not be disappointed. Michael L. Linver, MD, FACR, FSBI, will deliver “The Argument for Screening Mammography (and Against the United States Preventive Services Task Force Recommendations).” Later that afternoon, the agenda also includes a Controversy Session titled “Screening Mammography: Ending the Confusion,” with lectures on screening guidelines and personalized screening given by Debra L. Monticciolo, MD, FACR, FSBI, and Wendie A. Berg, MD, PhD, FACR, FSBI, followed by an “Ask the Experts” question-and-answer session.
Thursday morning breast topics begin with “BI-RADS [Breast Imaging Reporting and Data System] (An Interactive Session),” which includes lectures by Cecilia L. Mercado, MD; Eun L. Langman, MD; and Bonnie N. Joe, MD, PhD, FSBI, on topics covering mammography, ultrasound, and breast magnetic resonance (MR) imaging. In the afternoon, a Hot Topic Session titled “Personalized Screening for Breast Cancer” will include presentations by Emily F. Conant, MD, FSBI; Phoebe E. Freer, MD; and Fiona J. Gilbert, MD, on risk assessment, personalized screening paradigms, and personalized treatment of breast cancer.

Friday morning rounds out this week of outstanding activities with “Breast Imaging: Fundamentals of Interpretation.” Lectures on breast calcifications, masses, and asymmetries will be given by Stephen A. Feig, MD, FACP, FSBI; Gilda Cardeñosa, MD, FACP, FSBI; and Paula B. Gordon, MD, FSBI.

For those attendees looking for a hands-on experience, the “MR Imaging–Guided Breast Biopsy” workshops on Sunday and Thursday and the “US [Ultrasound]-Guided Interventional Breast Procedures” workshop on Monday offer excellent opportunities to sharpen your skills by directly interacting with a diverse and talented faculty of breast imaging experts from around the country.

In keeping with RSNA’s 2016 theme of “Beyond Imaging: Maximizing Radiology’s Role in Patient Care,” be sure to take the time to explore what this exciting meeting has to offer beyond the realm of breast imaging. The New Horizons Lecture titled “Beyond Imaging: Radiology of Tomorrow” on Tuesday by Hedvig Hricak, MD, PhD, FACP, promises to embody the spirit of this theme and will delve into the topic of “profound change” faced by our profession as we enter the era of precision medicine, deep learning, and artificial intelligence. If you can’t attend this presentation in person, don’t worry; you’ll have the opportunity to see it and many others through the RSNA Virtual Meeting, which will offer 25% more content, extended access, continuing medical education credit for live sessions, and more, all via your laptop, tablet, or mobile device.
Why I Chose Radiology

By Annie Ko, MD

It is 3 AM. The quiet hum of the computer cuts through the silence in the reading room. I am alone taking radiology overnight call, helping to be the special extra set of eyes for the clinicians upstairs and in the emergency room. A physician calls to discuss imaging for a patient who presented with a multitude of symptoms that seemingly have no interconnection. I review the images with her and propose a diagnosis that can connect the multiorgan system findings, a diagnosis that had not been considered previously. Tonight is quiet and I find myself reflecting on how fast the past 3 years have flown by and how I came to discover and love radiology.

Like most medical students, I was aware of the existence of x-rays, computed tomography, and magnetic resonance imaging, but I was not fully cognizant of their utility or the process of their interpretation. I had entered medical school with a desire to become a physician based on the role model I had: my family doctor. During clinical rotations I found joy in learning from each patient, from their presentation to diagnosis. Specialties with emphasis on diagnosis, such as neurology, captured my attention. During my pediatric rotation I experienced how radiologists can aid in detection of disease and treatment. I remember clearly the diagnostic dilemma a child posed with her nonspecific symptoms of lethargy and altered mentation. While our team sought a suspected diagnosis, a routine abdominal radiograph and subsequent ultrasound arrived at the correct identification of intussusception. I was amazed at the dramatic power of medical imaging and how quickly the sleuthing radiologist provided the key to definitive treatment.

As the third year clinical rotations drew to a close and time came to choose a specialty, I kept finding myself circling back to radiology. During my brief encounters with the field, I was impressed at how much radiologists add to patient care. I was in awe of their deep understanding of medicine and ability to tie together knowledge of human embryology, anatomy, pathology, and physiology. Although radiologists are often associated with limited patient interaction, I witnessed them as consultants in constant dialogue with each other and referring physicians, never in isolation. I dove deeper into the field with electives in interventional radiology and mammography, where I observed radiologists in a myriad of roles: diagnostician, interventionalist, consultant, and physician at the front lines of patient care, often interacting with patients in their times of uncertainty. It felt like the perfect combination to satisfy my interest in diagnosis, my intrigue with medical imaging, and my wish to preserve patient interaction.

Five years after making the decision to apply for radiology, I cannot see myself in any other field. I will be continuing subspecialty training in breast and body imaging. Throughout residency, mammography resonated with me as I particularly enjoyed the variety in daily practice involving procedures and patient interaction. In a way, the practice of breast imaging and following patients over time reminds me fondly of the relationship I had with my family physician.
What I’ve Learned:
John M. Boone, PhD,
FAAPM, FSBI, FCR, FAIMBE

By Shadi A. Shakeri, MD

John M. Boone, PhD, FAAPM, FSBI, FACR, FAIMBE, is Professor and Vice Chair of Radiology and Professor of Biomedical Engineering at the University of California Davis. He is Chair of the Board of the American Association of Physicists in Medicine (AAPM). He is well known for his work in developing breast computed tomography (CT) as well as radiation dosimetry. Dr Boone has trained hundreds of radiologists in the physics of imaging. As a resident over a decade ago, I was starstruck while learning physics from the expert who literally wrote the book with other equally renowned physicists in the department. I have had the good fortune and pleasure of collaborating with Dr Boone on breast imaging research projects. He is brilliant, a generous mentor, and an incredibly down-to-earth and fun colleague.

You have done pioneering work in breast CT. Was there a pivotal moment in your career that led you to where you are today?

Getting the big grant initially made the breast CT project happen. I got a biomedical research partnership grant. The partnership included the company Varian, the maker of the flat panel that is the enabling technology for breast CT, and scientists at Duke University, including Carey Floyd [PhD], who has since passed on. I think it was a $6.2 million grant. That was certainly a pivotal moment. We got out a bottle of champagne and celebrated that. We even got a letter from Senator Dianne Feinstein. Any grant over a million dollars per year got you a notice from your senator. So that was fun.

What advice would you give to a young person coming into the field?

I knew I was going be a scientist. As an undergraduate at Berkeley, like you, I took a lot of science classes and sort of found this route. And what a wonderful place it is, being able to do hard science at the interface with medicine so it has relevancy. I got my PhD in 1985 and went...
right into being an assistant professor. There was very little pressure at that time to get grant funding. That gave me the opportunity to play. I built some analysis tools for computer modeling imaging systems. This is my recommendation to any junior faculty: to pursue whatever their interests are and worry about putting it together as some directional research later on as an associate professor.

Do you have a guiding principle in life?

Seek the truth. I have to say that the science that we do, we do it plainly and truthfully. I tell my students we are going from this point to that point and it’s fun to turn over the rocks, but sometimes you have to step over the rocks to get to where you are going. I think research is about the truth.

If you were given the chance to do it all over again, what would you do? Would you repeat what you’ve done or choose a totally different path in life?

That’s a good question. I might have taken more time for myself along the way. But I’m certainly happy that I chose to be a medical physicist and it’s been a delightful career and wonderful path. I never punch out from being a scientist. In the shower, I think about science, and when I’m at a boring meeting, I think of the next paper we are going to write. I’m sort of an outdoorsman. I’ve sailed from LA [Los Angeles] to Hawaii and have been on expeditions to the Arctic and to the Amazon. I would have liked to do more of that.

What is the best piece of advice that you’ve received or the worst advice that you are glad you ignored?

A speaker at a faculty orientation said you should get a sign that says “publish or perish” and put it on your desk and look at it every day. As a scientist trying to get grants, your publication record greases the skids. Although that was an overt if not an in-your-face comment, there’s an element of truth to it. [Also] becoming involved in a professional organization creates a network of friends. You go to meetings and find commonality with people in your field, and that is a key to success in academia.

How do you stay so humble? You are one of the giants in your field and yet you are so down-to-earth.

I don’t know about the giant thing. I’ve gotten to the point [where] it’s fun to give back. It’s a blast to promote the careers of others. I would like to think that I have some humility, but some years ago I was giving a session at the RSNA [Radiological Society of North America] on how to write grants. I’m up on the podium and figured that I needed to introduce myself, and I mentioned my funding record. Later I got the critique, and for the question “What should he focus more on?” one person answered, “Humility!” That got my attention.

What are we missing in the current state of breast imaging or radiology?

I feel for the job of radiologists in particular. Radiologists are driven more and more for RVUs [relative value units] and the clinical workload. It’s sort of evolved that way with the pressures to
What I've Learned: John M. Boone, PhD, FAAPM, FSBI, FACP, FAIMBE, continued from previous page

keep the department in the black, and it’s led to a degradation of morale. The ACR [American College of Radiology] initiative Imaging 3.0 is trying to reemphasize the value of the radiologist, and I believe it will lead to higher satisfaction. In my leadership role in the AAPM, I’ve started a similar campaign called Medical Physics 3.0. A lot of diagnostic medical physicists come in at 5 PM and work through midnight to do the equipment evaluations and leave a report without ever being seen. We had an ad campaign with professionals sitting around a table with one of them whited out with the question, “Who’s missing at your table?” And in this case it’s the medical physicist, of course—the scientist in the room.

What is your favorite thing to do outside of work?

I like to take walks and spend time at my cabin in the mountains. It’s a wonderful, peaceful setting. Sometimes when I’m working on a grant I sit on the deck and work with the roar of the river in the background. I also like traveling and working in the yard. I have played guitar my whole life but that got sidelined with kids and work, but I am trying to play more these days. Although the SF [San Francisco] Giants aren’t doing so well this year, I have rekindled my love of baseball for some reason.

I know you’ve traveled the world. What is your favorite place? I also am aware of your love for California and I want you to comment on how you chose the names for the CT scanner generations.

I’m still looking for that trip to Antarctica so I can cross off my seventh continent. Places I like in the world outside of the US would be Nuremberg, Germany. I think it’s in a delightful setting in this medieval city. I also love Rome and Florence in particular.

I am proud of being a native Californian. I’ve lived in both Northern and Southern California as an adult. I recognized that we needed to come up with some lingo to refer to the breast CT scanners. The [prototype] scanners are named Albion, Bodega, Cambria, and Doheny after towns on the California coastline, in alphabetical order and running north to south. I’ll point out that only leaves Encinitas before we get to Mexico. Thankfully, I probably have only one more scanner in my career left to worry about!

If you had the opportunity to meet anyone in history, whom would you pick?

That’s a good one. Any physicist would say Einstein. Galileo would be another. He was so inventive. He invented the telescope and knew all sorts of things about the body. I’ve often wondered what it would be like to go back in time.

What have you learned from your children or trainees?

Having kids teaches you humility. They don’t give a hoot who you are. It’s been fun as my children became adults and learned humility themselves. After you put them through college and maybe some stuff afterwards, they come back and say thank you. I was blown away.
What I've Learned: John M. Boone, PhD, FAAPM, FSBI, FCR, FAIMBE, continued from previous page

You know, PhD students work with you for 5 or 6 years, so they are almost like your kids. I still interact with former students 10 or 15 years after they graduate. It comes with the responsibility.

What do you see for the future of breast imaging?

If you look at the field of radiology when I started in the 80s, it was all about radiography then. CT was around and MR [magnetic resonance] was fledgling and ultrasound was always there. But the physicians were experts at reading chest x-rays and KUBs [kidney, ureter, bladder] and everything else. Where did the practice of radiology go? It went to 3-D with greater access to CT and MR scanners. I see no reason why breast imaging won’t do the same thing for the same reasons. 3-D imaging gives you more information than 2-D. Breast tomosynthesis is a step in that direction but it is not fully 3-D. Not to tout our project too much, but I do think that breast CT will become a reality in clinical breast imaging. Of course, Dr Ning’s breast CT system has been FDA [US Food and Drug Administration] approved, and others will follow. Breast CT offers the ability to do 3-D imaging in a less expensive way [than MR] and with a smaller footprint, and the breast clinic would have control of the system—as opposed to MR, where breast scans need to be fit into a schedule with knees and heads and shoulders.

CALL FOR ABSTRACTS

The Society of Breast Imaging welcomes the submission of original scientific abstracts related to breast imaging for the SBI/ACR Breast Imaging Symposium

April 6-9, 2017 – Los Angeles, California
Authors must submit abstracts using the online system.
For more information and guidelines for submission: http://bit.ly/sbiabstracts

SUBMISSION DEADLINE: November 14, 2016 11:59 PM EDT
# Upcoming Events & Activities

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<td>SBI and Men’s Health Network Webinar</td>
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For a listing of other society events please check out the SBI Calendar of Events at [www.sbi-online.org](http://www.sbi-online.org)