



SBINNEWS

The Member Newsletter of the Society of Breast Imaging



INSIDE THIS ISSUE:

- In Memoriam: Lawrence W. Bassett, MD, FACR
- Radiological Society of North America 2020 Annual Meeting Review
- The Newly Formed Young Physician Section: Get Involved Early



Top: SBI Fellows meeting.

Right: The newly inducted SBI Fellows. Top row (L-R): Kathleen R. Brandt, MD, FSBI; Fernando Collado-Mesa, MD, FSBI; Anna I. Holbrook, MD, FSBI; Carrie B. Hruska, PhD, FSBI; Stuart S. Kaplan, MD, FACR, FSBI. Bottom row (L-R): Jiyon Lee, MD, FACR, FSBI; Vilert A. Loving, MD, MMM, FSBI; Alfred B. Watson Jr, MD, MPH, FACR, FSBI; Jean M. Weigert, MD, FACR, FSBI.



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President's Column

OUR SBI MISSION:

To save lives and minimize the impact of breast cancer

OUR SBI VALUES:

Patient-centered and evidence-based care

Excellence in education

Scientific integrity

Collaboration and collegiality

Respect for diversity and inclusiveness



Jessica Leung,
MD, FACR, FSBI
President of the SBI

It is the best of times, and it is the worst of times. Although coronavirus disease 2019 (COVID-19) hospitalization rates are at their highest, 2 vaccines are being administered around the country. It is truly remarkable that an effective vaccine has been developed and is being administered in less than 1 year. And this is the first mRNA vaccine, with potential applications in fighting not only infectious diseases but also cancers. What is clearly evident even at this early stage of the vaccine program is that science is essential and that success can be achieved only through coordination and collaboration, much like what we do in breast imaging.

This past fall, the SBI Inclusion Diversity Equity Alliance, Social Media Committee, and Communications and Advocacy Task Force combined ideas and efforts and hosted a webinar titled "Health Equity in Breast Imaging," which was featured on Facebook Live with later viewing available on the SBI YouTube channel. The SBI Social Media Committee, in collaboration with the American Society of Breast Surgeons, also hosted a Twitter chat titled "Breast Cancer Risk: What Patients Should Know." This event was featured in 2658 timelines at the peak of the chat, leading to a reach of 24,000 over the span of the evening into the following day.

We are stronger together, and our collective voice is louder and more effective. The SBI has a seat on the board of directors of the Academy for Radiology & Biomedical Imaging Research, with Mimi Newell, MD, FSBI, serving as SBI's representative. Along with 17 other radiology organizations, the SBI signed a letter to the federal government requesting recognition of medical research as a top national priority, highlighting the continued need for supplemental COVID-19 funds, and urging a continued strong commitment to meaningful growth across disciplines and disease areas when budgeting federal funds. Additionally, SBI is a signatory along with 350 other institutions and organizations, led by the American Association for the Advancement of Science and the American Society for Microbiology, on a letter to Congress advocating for meaningful funding increases for federal science agencies in fiscal year 2021 appropriation bills and for emergency supplemental funding for research relief because of the extraordinary disruptions to research in the wake of the pandemic. Advocacy, especially in a united, evidence-based manner,

indeed results in positive change. Through the collective action of the ACR, SBI, patient advocates, and others, an extension of an existing moratorium was secured prior to the end of 2020 as part of the Consolidated Appropriations Act, 2021 (omnibus and coronavirus relief bill) so that the 2002 US Preventive Services Task Force breast cancer screening guidelines would continue to be recognized instead of relying on the 2009 or 2016 guidelines. This is important for our patients because it means that the Affordable Care Act mandates that insurers financially cover annual screening mammography for every woman aged 40 years or higher. Otherwise this coverage would not be guaranteed after January 2022.

The criteria for SBI fellowship have now been updated, and we welcomed the first group of 9 diverse new fellows at a virtual meeting on December 7, 2020. Under the new criteria, additional achievements and activities are considered equivalent (in part) to publications. Specifically, under the leadership of Elizabeth Morris, MD, FACR, FSBI, as chair of fellows, the Fellowship Committee approved a waiver for certain requirements in publications if the candidate was able to demonstrate "long-term, sustained, verifiable activity" in the following areas as pertaining to breast imaging, breast disease, and breast health: education, administrative or political activities, and service to patients or SBI. This expansion allows for a more inclusive and encompassing recognition of the multifaceted contributions that help our patients and advance our field.

The first ever virtual SBI symposium is just around the corner in April 2021! We are energized and confident about this platform, especially since the virtual fellows' meeting that took place on December 7, 2020, was an incredible success, with the largest participation ever. We were able to chat in small breakout rooms and to hear from retired fellows who typically would not be in attendance. Although this new format was born of necessity because of the COVID-19 pandemic, we are happy that we are able to reduce the registration fee for the 2021 symposium because of lower expenses associated with the virtual (vs in-person) platform. The fee will be nominal for in-training, affiliate, and active-duty military registrants, and it will be complimentary for retired members and international members. We hope this will allow for unprecedented participation in numbers, demographics, and geographic location. After the symposium, the content will also be available online for viewing and attaining CME credit. There will be a cornucopia of sessions ranging from clinical reviews to research frontiers to policy and guidelines. Professor Jack Cuzick (of the Tyrer-Cuzick model) will be delivering his lecture on personalized breast cancer risk assessment from across the pond, and he will be available for real-time questions. There will be creative offerings to socialize, network, and engage. Please register early to receive your virtual meeting care package!

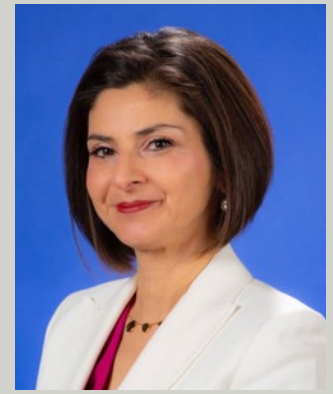
During times of change and uncertainty, networking and mentorship become even more important. With Laurie Margolies, MD, as chair, the Mentorship Committee has made great strides in formalizing mentorship programs in the SBI. These programs will be comprehensive, spanning clinical medicine, research, and education in conjunction with practical, everyday workplace advice. Notably, a new software program will be employed for matching mentors and mentees. We will be looking for beta testers for this software in the spring of 2021, and we hope that you will consider volunteering at that time.

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Editor's Note

By Shadi A. Shakeri, MD (Twitter: @shadishakeriMD)

2020 felt like a year that would never end. But looking back now, it feels like the shortest year in recent memory. I realize this is partially due to the fact that I did not experience any of the normal milestones that mark the passage of time. For me, these usually include a springtime getaway, the SBI annual symposium, summer vacation to rest and recharge, back-to-school time, the Radiological Society of North America (RSNA) annual conference, and the holiday season with family. In 2020, none of these occurred in their full glory.



Shadi A. Shakeri, MD

Although we missed the magic of thousands of radiologically minded people congregating in Chicago for the RSNA conference, it was nice to have the option of accessing presentations without worrying about crisscrossing through McCormick Place. Randy Miles, MD, and Nidhi Sharma, MD, have covered some of the hottest topics in breast imaging at the RSNA, including advances in artificial intelligence. Be sure to review their breast radiology highlights.

In this issue we have published the last part of the communications series under the guidance of Mary Scott Soo, MD, FSBI, and Meredith Watts, MD. I have gone back and revisited this entire series in preparation for the [21st Century Cures Act](#), which is now in effect. This new federal law mandates that patients have immediate and full access to their medical records. At our practice, this means that our radiology reports and addenda documenting pathology results and concordance recommendations would be immediately released to patients. As a result, we have now changed our practice to communicate all breast biopsy results directly with our patients prior to documenting this information in our reports. The articles about communication and breaking bad news have come in particularly handy as many of us are incorporating the process of discussing cancer results with our patients as part of our daily work.

In this issue we have also introduced a Young Physician Section Column, which represents the voice and interests of a newer generation of breast radiologists, along with our Member-in-Training Column. One such vibrant and energetic breast radiologist, Amy K. Patel, MD, updates us on the advocacy efforts of the SBI and ACR

on behalf of radiologists and our patients in "Breaking Down the Legislative Whirlwind of 2020 and Beyond."

As always, you will find fascinating physics content procured by Elizabeth Krupinski, PhD, with reporting by Sarah Lewis, PhD, introducing us to her research with phase-contrast imaging for breast cancer.

Read the latest news about the Canadian Society of Breast Imaging, all of the tireless work of our SBI committees, and an update from SBI President Dr Leung.

Lastly, we celebrate the life and contributions of Larry Bassett, MD, FACR, whose passing has left our community with great sadness. Read the touching tribute by Valerie P. Jackson, MD, Nanette DeBruhl, MD, Anne Hoyt, MD, and Nazanin Yaghmai, MD. You can also access the recording of his memorial here:

Gathering Us Memorial Site: <https://www.gatheringus.com/memorial/lawrence-wayne-bassett-md-facr/6154>

Zoom Recorded Memorial (Time: 2 hours and 57 minutes, 42 seconds): Download File Size: 1.7 GB https://gatheringus.zoom.us/rec/play/LZnQp1biAWhss2rvAuZh4w7evsD1cH_0t1Bq5PKrXnhnqB33TSWchtGwFRvFaa7EXwyN2WAwwmmNrgEh.1k6GtHofCAVMihll

Photo Slideshow: <https://drive.google.com/file/d/1nr35q74pYCRx8PTU7vXY-zUV8hmJXfMF/view>

He was truly a pioneer of our field and we will miss him.

President's Column (continued from page 3)

It is with profound sadness that I report the passing of our great mentor and SBI Past President Dr Lawrence Bassett in December 2020. Larry was a pioneer in breast imaging in the truest sense, deservedly honored with the Gold Medal from SBI and ACR. We are grateful to Valerie Jackson, MD, FACR, FSBI, for the beautiful memorial article in this issue celebrating the remarkable, meaningful life of our colleague and friend.

Medical school applications are reportedly up 18% (reported range of 7% to 28%) for the upcoming 2021 academic year. This is compared with the usual increase of 1% to 3% per year reported by the Association of American Medical Colleges. Some have dubbed

this phenomenon the *Dr Fauci effect*. Regardless of the term, the recognition of health care workers as heroes is very real indeed. In this new year, let's celebrate each other, continue to strive together for a more perfect health care system, and inspire the next generation to make a difference. Much happiness and best of health to you and your families in 2021!

Jessica Leung, MD, FACR, FSBI
President, Society of Breast Imaging



In Memoriam: Lawrence W. Bassett, MD, FACR

By Valerie P. Jackson, MD; Nanette DeBruhl, MD; Anne Hoyt, MD; Nazanin Yaghmai, MD

Lawrence W. Bassett, MD, FACR, professor emeritus of radiological sciences at the David Geffen School of Medicine at the University of California, Los Angeles (UCLA), passed away peacefully on December 15, 2020. Larry was a giant in the field of breast imaging and had a significant impact on the lives of his friends, colleagues, trainees, and the women of the world.

Larry was a graduate of University of California, Irvine, School of Medicine and completed his internship at Northwestern University. He then served in the US Navy, including a tour of duty in Vietnam. He did his radiology residency at UCLA, where he joined the faculty in 1974, rising through the ranks to become a professor and ultimately the Iris Cantor Professor of Breast Imaging. Larry was the director of breast imaging at UCLA from 1976 until he retired in 2016 after an illustrious career.

Like many radiologists of his time, Larry did not start out in breast imaging. He began in the bone imaging section, working with Dr Richard Gold, who mentored him in bone and subsequently breast imaging. At the time, it was common for academic radiologists in predominantly outpatient subspecialty areas (such as musculoskeletal radiology) to be assigned to do breast imaging. Larry enthusiastically embraced this assignment and was instrumental in the development of the breast imaging section at UCLA, where he was dedicated to giving patients the highest quality of care. He also recognized the need to provide exceptional education to radiology residents and breast imaging fellows. His educational efforts soon expanded beyond UCLA to include breast imaging radiologists and technologists around the world.

At UCLA, he is most remembered for his commitment to first-rate patient care and lifelong dedication to training medical students, residents, fellows, and technologists to become experts and leaders in the field of breast imaging. He was a humble, approachable, passionate advocate and educator of each

of his team members, regardless of title. He was an assistant dean for student affairs at the David Geffen School of Medicine at UCLA from 1985 to 2010. In the UCLA Department of Radiological Sciences, he was the director of the radiology residency program from 1978 to 1983 and from 1985 to 1990, vice-chair of education from 1986 to 1990, and vice-chair of academic affairs from 2006 to 2016. He was also the medical director of the Northridge-UCLA Baccalaureate Program for Radiology Technologists from 1977 to 1983, an unusual role for such an accomplished and busy section chief.

Larry was the consummate volunteer. He enthusiastically gave countless hours to many organizations, including ACR, SBI, Radiological Society of North America, American Board of Radiology (ABR), and governmental agencies. Larry was internationally known for his role in the development of national guidelines to ensure high-quality mammography through the Mammography Quality Standards Act, which was approved by Congress in October 1992. In the early 1990s, Larry served as cochair with Dr R. Edward Hendrick for the ACR/Centers for Disease Control and Prevention Cooperative Agreement for Quality Assurance in Mammography (1991-1994) and for the Agency for Health Care Policy and Research Quality Determinants of Mammography Panel (1992-1994), where they were tasked with establishing essential criteria needed to deliver high-quality mammography.

Larry played an immense role nationally in the development and evolution of breast imaging as a subspecialty in radiology. In 1983 he was one of the original members of the ACR Committee on Breast Imaging, which was later replaced by the ACR Breast Task Force. He chaired both committees from 1990 through 2000. He was also an original member of the ACR Mammography Accreditation Program and the Committee for Standardized Mammography Reporting: the Breast Imaging Reporting and Data System (BI-RADS). As the chair of the ACR Committee on Breast Imaging, Larry was pivotal in adding the breast imaging section to the ABR oral certifying examination for diagnostic radiology in 1990 and he became one of the first examiners, a role he fulfilled annually until 2014.



SBI meeting at 2004 Radiological Society of North America (RSNA) annual meeting. Photo probably taken by Mike Linver.

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In Memoriam: Lawrence W. Bassett, MD, FACR (continued from page 5)

The SBI was formed in 1985 and Larry was one of the early invited members. In 1992, he was a strong proponent of the transition of SBI to an open national society. He was instrumental in the development of the first SBI Postgraduate Course and many future courses. He served as SBI president in 1993 and 1994.

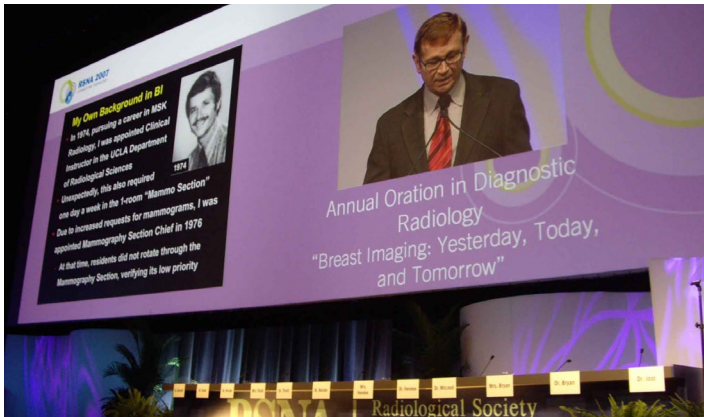
He was an accomplished, well-published academic radiologist who was the recipient of many grants and extramural sources of funding for research and quality control in breast imaging. Larry was active in research throughout his career, focusing on evaluation of various breast imaging technologies, including digital mammography, tomosynthesis, ultrasound, and magnetic resonance imaging. He was the first author of 12 books, coauthor of an additional 14 books, and author or coauthor of over 180 peer-reviewed journal articles. He served on multiple scientific journal editorial boards.

Larry was also a sought-after speaker around the globe, delivering more than 550 invited speeches, and he was the recipient of numerous awards for teaching, academic achievement, and clinical service from local, national, and international societies and organizations. Highlights include the ACR's most prestigious award, the Gold Medal, in 2011 and the SBI Gold Medal in 1997. He received David Geffen School of Medicine at UCLA's most significant honor, the Sherman M. Mellinkoff

Faculty Award, in 2004 and the UCLA Alumni Association's Distinguished Teaching Award in 1987. The ABR presented him with the Distinguished Service Award in 2000 and the Lifetime Service Award in 2010.

Of all of his accomplishments, Larry was most proud of the breast imaging fellowship program he founded. During his tenure, he trained over 100 fellows who have continued his legacy of excellence in breast imaging, helped improve the international shortage of qualified breast imaging specialists, and have become recognized leaders in the field. Although Larry did not have any biological children, he was richly blessed with many "fellow children" who made him proud and fondly consider him their "father."

Those of us who knew Larry will forever remember him not only for the giant he was in the field of breast imaging, his utmost dedication to patient care and education, and the impact he had on his trainees but also for the humble, kind, funny, and generous person that he was. He was an early adopter of technology—the first we knew to have an Apple "laptop" computer (weighing about 30 pounds) and an iPhone. He was a genuine friend and mentor and a great human being, with wide-ranging interests including human rights, animals, and history. He always saw the humor in life and loved a good prank. He will be greatly missed.



Presentation of the Annual Oration in Diagnostic Radiology, RSNA 2007 (photo by Val Jackson).



Presentation of the Annual Oration in Diagnostic Radiology, RSNA 2007 (photo by Val Jackson).



John, one of Larry's beloved cats, wearing Larry's badge from the 2007 SBI meeting (photo by Larry Bassett).



Larry loved a sale—and also pictures of misspelled words. Photo by Val Jackson in San Francisco on September 13, 2001 (2 days after the September 11 attack, which occurred during the ACR annual meeting).





SBI Committee Updates

By Yasmeen J. Fields, CAE



Yasmeen J. Fields, CAE

Society committees are composed of committed, hardworking SBI members who dedicate their time to supporting society initiatives. Read on for updates and ongoing committee activities.

The **CME & SAM Committee** will be meeting in January 2021 to discuss new initiatives from the Education Committee for 2021. These include a radiology business webinar series, the monthly Symposium Replay, SBI Exam, and 2021 symposium education plan. A full list of educational offerings from SBI can be found [here](#).

The **Fellowship Match Committee** met on December 7 to discuss the ongoing Match cycle. The application period for the 2021 Match began on August 1, 2020, and virtual interviews began November 1. An updated breast imaging curriculum was accepted by the *Journal of Breast Imaging* and will be available in 2021. Other radiology subspecialties using the National Resident Matching Program are emergency, interventional, musculoskeletal, and neuroradiology. The committee also discussed ways to increase responses to the 2020 Match Survey for applicants, and it plans to host a joint meeting with all fellowship program directors in late January or February 2021.

The **Inclusion Diversity Equity Alliance (IDEA), Social Media Committee,** and **Communications and Advocacy Task Force** joined forces to host a webinar titled “Health Equity in Breast Imaging” in October to kick off Breast Cancer Awareness Month. The dialogue was featured on Facebook Live and is available on the SBI YouTube channel. The expert panel was moderated by Amy Patel, MD, and it featured Nina Watson, MD, Peter Eby, MD, FACR, FSBI, Cedrina Calder, MD, and Regina Hampton-Coleman, MD, FACS. A unique and informative perspective was provided by Ms Julet Queensborough, a survivor and breast health navigator at Mattapan Community Health Center. The webinar received 799 views on the day of posting and reached 19,809 timelines across Facebook in the days following. SBI recognizes this powerful tool to provide educational outreach to our members and stakeholders.

Inclusion, diversity, and equity elevate achievements and enhance daily emotional and intellectual experiences for all. Most importantly, they bring about understanding of the experiences of underrepresented groups necessary to make meaningful change and improvement. To assist with the development of a strategy to ensure SBI is an inclusive, diverse, and equitable society for our members, IDEA will be conducting a survey to systematically examine aspects of SBI to enhance its effectiveness in meeting the needs of all members and their health care communities and patient populations.

8 *To save lives and minimize the impact of breast cancer.*

The **Membership Committee** is in the early planning phase of a model for presenting a series of online membership recruitment events to be held in conjunction with regional and state radiological societies and breast imaging divisions. These events will focus on outreach and engagement for current and prospective members at the junior level—medical students, residents, and fellows. To that end, the Membership Committee is working in conjunction with the Resident and Fellow Section (RFS) and Young Physician Section (YPS) Committees to curate an up-to-date list of residency programs and state radiological societies and their primary contacts.

The **Mentorship Committee** has finalized drafts for mentorship interest surveys, outcome surveys, and a document detailing expectations and responsibilities for members engaged in mentoring relationships. Feedback from the IDEA, YPS, and RFS Committees was incorporated into these final documents. The committee also provided feedback on the Mentor Match online hub, which is currently in its beta form.

The **Nominating Committee** met this fall to discuss the 2 new open positions on the SBI Board of Directors. Dr Paula Gordon, serving as secretary-treasurer, and Dr Margarita Zuley, serving as immediate past president, will both rotate off the board in April 2021. To be eligible to serve on the SBI Board of Directors, one must be a fellow in the society.

The **Patient Care and Delivery Committee** continues to be extremely active. The committee’s 2-part survey of coronavirus disease 2019 practices is complete, with a manuscript under review by the *Journal of Breast Imaging* and 2 more manuscripts in preparation. The content from these surveys will also be featured at the SBI 2021 symposium. The transgender survey recently closed, and the committee will shortly begin data analysis. The review article on axillary management is undergoing additional revisions within the group. Another survey on how practices use outside interpretations is under development.

The **RFS Committee** met in October to discuss recent activities and additional goals for 2021. The Applicant Guide resources developed by the RFS and Match Committees have been well received by members in training and fellowship program directors and were promoted to all SBI members as well as to members in

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GLOBAL HEALTH AND BREAST IMAGING: HOW TO GET INVOLVED AS A TRAINEE

By Amina Farooq, MD

Compared with women in high-income countries, women in low- to middle-income countries are generally diagnosed with breast cancer at later stages and are more likely to die of the disease. Global health and breast imaging are not mutually exclusive. If you're a breast radiologist trainee with an interest in global health, here are some resources to get involved!

Current programs invested in breast imaging and global health include the RAD-AID Breast Imaging program (<https://rad-aid.org/programs/breast-imaging/>), Health4TheWorld Radiology (<https://health4theworld.org/academy/curriculum-for-radiology/>), and MRI Online (<https://mrionline.com/>). RAD-AID Breast Imaging allows volunteers to get involved with projects at the ground level in different countries across the globe. There are also opportunities to begin new projects in countries that do not have established RAD-AID relationships. If you're interested in teaching opportunities, RAD-AID, Health4TheWorld, and MRI Online provide excellent virtual platforms for sharing knowledge of current guidelines and procedural techniques with other trainees across the globe.

Don't forget to check out the Goldberg-Reeder Resident Travel Grant (<https://www.acr.org/Member-Resources/rfs/fellowships/Goldberg-Reeder-Travel-Grant>) offered by the ACR Foundation. This grant allows current radiology residents and fellows to spend at least 1 month assisting health care in a developing country. The grant was created to encourage international volunteer service among members in training.



Amina Farooq, MD

There are so many ways to get involved in global health as a trainee and remain engaged throughout your career. What we will do as breast radiologists has life-saving impact not just at our institutions but also around the world.

SBI Committee Updates (continued from page 8)

training. The committee is brainstorming topics for a Twitter chat geared toward radiology trainees and planned for early 2021.

The **Social Media Committee** collaborated with the American Society of Breast Surgeons to host a Twitter chat titled "Breast Cancer Risk: What Patients Should Know." Moderators for the event included representatives from both organizations: Randy Miles, MD, Kimberly Beavers, MD, Lillian Erdahl, MD, and Carla Fisher, MD. At the peak of the chat, 2698 timelines featured the content, and the chat reached 24,000 viewers by the next day. In addition, members of the committee took control of the SBI Instagram profile for the IG Takeover project throughout October and November as additional education and outreach to patients. The patient education content reached 12,000 timelines and garnered 44 new followers.

The **YPS Committee** is building its digital presence in the form of a web page detailing young physician member benefits and resources related to career development, the fellowship-to-practice transition, wellness, and more. The committee is also developing a standing YPS Column to be included in the SBI newsletter, debuting in this issue.

The call for new committee volunteers began November 18 and concluded on December 18, 2020. We are grateful to all applicants and our current committee members for their continued hard work and dedication to the society's mission and goals!

Delivering Breast Biopsy Results

By Mary Scott Soo, MD; Roger Yang, MD; Brandi Nicholson, MD; Meredith Watts, MD

For many patients undergoing a breast biopsy, receiving results is the crux of the entire experience. Waiting for results is particularly challenging. Fear and uncertainty during this time can lead to clinically significant anxiety and a physiologic stress response equivalent to receiving a cancer diagnosis.¹ Moreover, for patients receiving a cancer diagnosis, the method of delivery can have a lifetime impact. In one study, patients with terminal cancer reported clearly remembering when, where, and how they were told of their initial cancer diagnosis and whether or not they felt supported by the provider. Patients felt most devastated by lack of empathy when the news was delivered.²



Although patients clearly remember how providers make them feel when the news is delivered, they often do not retain detailed information about the diagnosis and next steps at this time of emotional distress. Conveying this information in a skillful manner, ensuring understanding, and providing support are therefore critical to the patient's experience as cancer care is initiated.³

The 2 most common methods of delivering breast biopsy results are by telephone and in person. Many patients prefer to receive results by phone because this method reduces the waiting time, but an in-person interaction provides the opportunity to convey more detailed information, empathy, and support.⁴ Face-to-face electronic communications, or video visits, are emerging as an effective means of patient communication during the pandemic, and these may prove to be a useful hybrid of the phone and in-person approaches. In many practices, the radiologist communicates the results to the patient using these methods, either alone or with the assistance of physician extenders. In other settings, referring providers (eg, breast surgeons) prefer to deliver the biopsy results to ensure that a consistent recommendation about subsequent treatment is conveyed. In these cases, the radiologist should notify referring providers of results and confirm imaging-histology concordance. A referring provider who has an established relationship with a patient might have a better sense of the patient's specific desires for next steps. For breast surgeons, delivering malignant, high-risk, or discordant biopsy results naturally leads to discussions about surgical treatment recommendations. For instance, the breast surgeon might have very specific paradigms for addressing borderline or controversial lesions, such as lobular neoplasias and papillary lesions. In larger radiology practices, radiologists might staff multiple centers that have very different result delivery protocols. Attempts to unify the protocols could be met with resistance based on the needs of different referring providers and patients who are used to and prefer local protocols.

Radiologists in these settings must be flexible and learn to rely on local team members for guidance.

Nonphysician radiology team members, such as nurse navigators, technologists, or trained biopsy coordinators, might also assist in delivering results, allowing the radiologist more time to address clinical duties. In some cases, these physician extenders spend more time than the radiologist interacting with the patient during the biopsy process. After conferring with the radiologist about the result, these trained members of the breast imaging team can frequently deliver the entire discussion of concordant benign results to the patient. Likewise, in conjunction with the radiologist, they can be very helpful in conveying information regarding malignant results and navigating upcoming oncology appointments.

Telephone Notifications

In many practices, radiologists discuss biopsy results with patients over the phone. While some phone conversations last only a few minutes, others can last much longer, and patients commonly call back to ask additional questions. Therefore, it is important for the radiologist to properly prepare for the initial encounter. Radiologists must make these calls at a time when interruptions will be minimal, avoiding busy clinic times when there is pressure to read a backlog of images. Before the call, radiologists need to tune in to their own mental and emotional states, becoming present and focused on the upcoming discussion.

SPIKES and other communication models can be used for delivering a cancer diagnosis.^{5,6} Important components of these encounters include developing immediate rapport, disclosing the results, evaluating the patient's response, discussing further steps (eg, surgical referral), providing follow-up appointments, assuring understanding, and providing support.⁶ The radiologist is unable to read the patient's body language during phone calls, unlike in-person discussions, so identifying physical cues from the



patient is difficult. Therefore, the radiologist must listen carefully and allow the patient time to digest the information and ask questions. Because patients are often anxious about next steps, providing follow-up oncology appointments and establishing a framework for what to expect during the appointments helps patients manage their anxiety. Contacting the referring provider about the result is also an important part of this process.

In-Person Notifications

Compared with telephone notifications, delivering results in person often requires more time and additional considerations. As with discussions by phone, having quiet, uninterrupted time is essential. With in-person communications, the radiologist has the advantage of assessing body language, can reach out physically to the patient when appropriate, and can provide a silent presence when patients need a moment to grasp the information provided. Having a nurse navigator or other physician extender accompany the radiologist to the meeting is an additional benefit. Physician extenders can shorten the time the radiologist is needed during the encounter by discussing appointment details and other practical questions. Providing the patient with preprinted materials such as explanations of biopsy results, differences between in situ and invasive disease, information about multidisciplinary appointments, and possible dates and locations of additional staging studies such as breast magnetic resonance imaging may be helpful in this setting.

Explaining results in person also provides opportunities for patients to courageously ask questions weighing most heavily on their minds, such as “Am I going to die?” Being prepared to respond to this question in the most supportive way is critical. For more advanced disease, it is important to realize that no radiologist, and probably no physician, can truly know the answer to that specific question for that particular patient. Even if the outlook is grim in the radiologist’s assessment, medical treatments continue to improve, and the particular patient could be one who makes a remarkable recovery. Therefore, these questions should be met with encouragement and support,

urging the patients to participate in their care plan. Patients feel very isolated at this time, so it is important to assure them that their medical team will be there to support them. Some patients with large tumors feel reassured to hear that other patients with similar disease have had tumors completely respond to medical therapies. In addition, discussing how additional information will be obtained for staging can prepare patients for further medical workup.

For patients with much smaller lesions whose situations appear less dire, providing hope is critical at this juncture. With a gentle caveat that not all staging information is available, relaying to these patients that the vast majority of patients with early-stage disease do well is quite encouraging. This can open the conversation to a discussion of the importance of axillary lymph node status, clinical examination findings, and tumor receptors.

In conclusion, conveying biopsy results in a skillful manner, assuring understanding, and providing support are critical to the patient’s experience as cancer care is initiated. A thoughtful, compassionate, and patient-centered approach—whether in person, by phone, or with a hybrid method—can have lifelong benefits for patients, leading to improved patient satisfaction, active collaboration, shared decision-making, and most importantly, improved health outcomes.

References

1. Lang EV, Berbaum KS, Lutgendorf SK. [Large-core breast biopsy: abnormal salivary cortisol profiles associated with uncertainty of diagnosis](#). *Radiology*. 2009;250(3):631-637.
2. Kübler-Ross E. *On Death and Dying: What the Dying Have to Teach Doctors, Nurses, Clergy And Their Own Families*. MacMillan; 1969.
3. Soo MS, Shelby RA, Johnson KS. [Optimizing the patient experience during breast biopsy](#). *J Breast Imaging*. 2019;1(2):131-138.
4. Schultz SK, Wu R, Matelski JJ, Lu X, Cram P. [Patient preferences for test result notification](#). *J Gen Intern Med*. 2015;30(11):1651-1656.
5. Soo MS. Breaking bad news in breast imaging: strategy and structure. *SBI News*. 2020;(2):26-27.
6. Soo MS. Interventional procedures: patient-centered approach. In: Kuzmiak CM, ed. *Interventional Breast Procedures: A Practical Approach*. Springer; 2019:1-19.

The SBI Newsletter Committee is excited to provide interesting cases for our members. Our hope is that interesting cases will illustrate 1 or more valuable teaching points for a scenario or combination of findings that may emerge in any type of daily practice. We are happy to accept an interesting case from any individual or group. The description of a single extremely rare entity (case report) is discouraged unless there is an important aspect to the work-up, imaging, or clinical picture that merits discussion and can be more widely applied. Please contact Amanda Lenderink-Carpenter, MD, for questions or submissions at alenderink@gmail.com.

Interesting Case: Treatment of Rare Complication After Breast Biopsy: Pseudoaneurysm

By Donatella Pavel, MD; Bernadette Cardona-Ramos, MD; Tiffany Han, MD; Mia Kazanjian, MD; Andrew Shih, MD; David Klein, MD; Lea Lecaj, BS

A 43-year-old woman presents for evaluation of a lump in her right breast that she noticed 2 days prior to her appointment. Diagnostic mammography and targeted ultrasound were performed. (Figures 1 and 2)

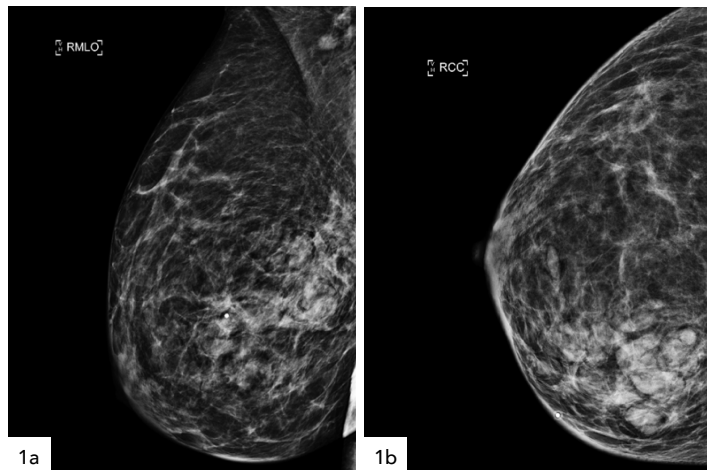


Figure 1. Diagnostic mammogram of the right breast demonstrates a high-density 53 × 47-mm mass in the upper inner quadrant of the right breast with associated skin thickening.



Figure 2. Targeted ultrasound demonstrates a complex solid and cystic mass at the site of palpable concern, correlating with the mammographic mass.

The examination was assessed as BI-RADS 4, suspicious, and ultrasound-guided core-needle biopsy was recommended. Ultrasound-guided core-needle biopsy was then performed with a 14-gauge needle. Prolonged bleeding after the procedure was noted.

Later that day, the patient presented to the emergency department for recurrent and persistent bleeding at the biopsy site. Subsequently, an ultrasound was performed (Figure 3).

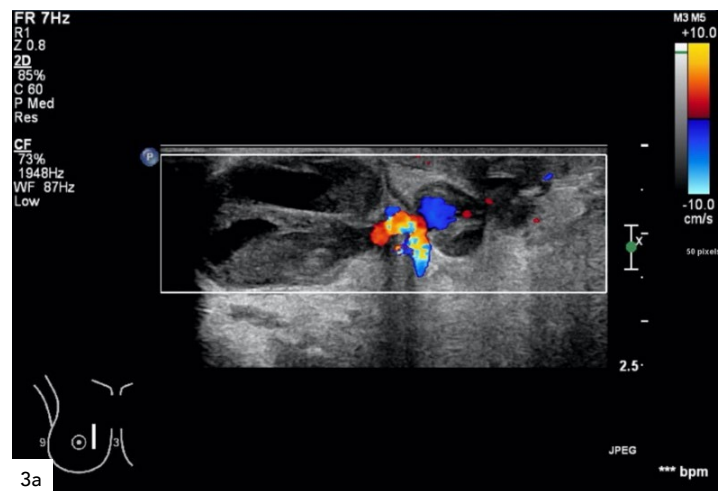


Figure 3. Ultrasound with color flow demonstrates the biopsied complex solid and cystic mass, measuring up to 54 mm, with a prominent arterial vessel feeding a 9-mm, partially thrombosed pseudoaneurysm.

The patient subsequently underwent an ultrasound-guided thrombin injection in the right breast (Figure 4). The procedure was tolerated well without complication. Follow-up ultrasound confirmed absence of abnormal vascular flow and pulsatility, indicating pseudoaneurysm resolution. Small residual hematoma was noted.



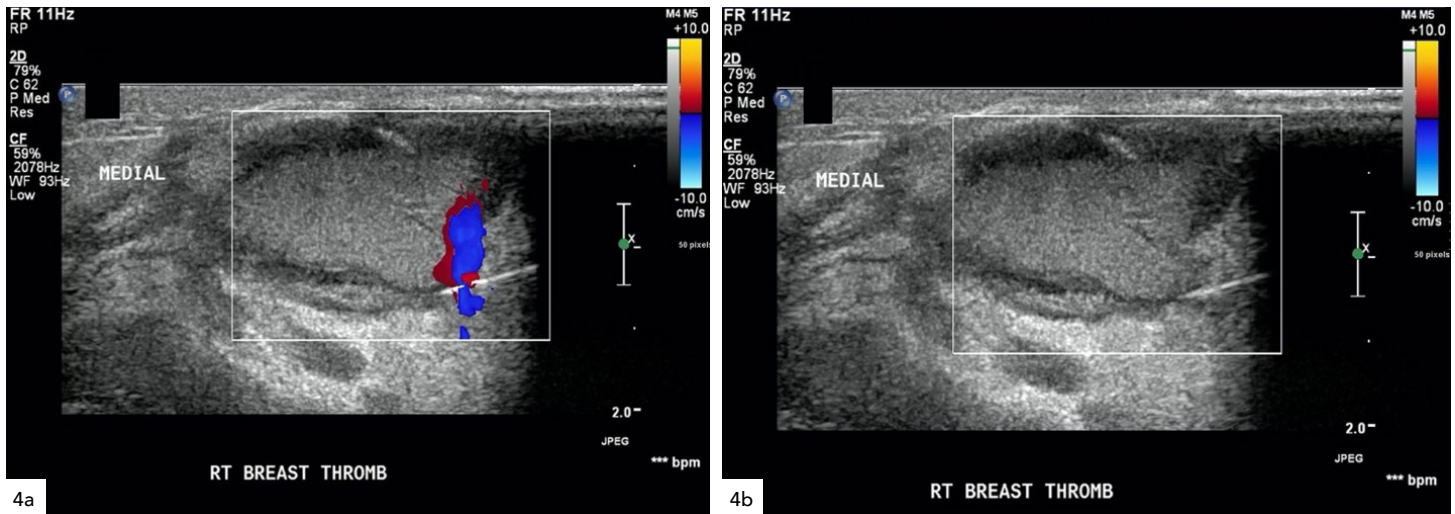


Figure 4. Ultrasound images before (4a) and after (4b) thrombin injection for pseudoaneurysm treatment. Prominent vascular flow is seen within a feeding vessel before the injection; no flow is seen after the injection.

There are 4 options for pseudoaneurysm management: (1) manual compression, (2) thrombin or ethanol injection, (3) embolization, and (4) surgical intervention/repair for patients in whom surgery was already planned. Each of these options has unique benefits and risks.

Thrombin catalyzes the conversion of fibrinogen to fibrin, thereby activating procoagulant factors (V, VIII, and IX) in the coagulation cascade. This process activates platelets, and the main goal is vascular hemostatic control or, in this case, thrombosis of a pseudoaneurysm.

Pseudoaneurysms can thrombose spontaneously. If they do not, they may enlarge and eventually represent a contained blood collection. Contained blood collections pose a risk for rupture, which can be life threatening, especially if they occur in anatomic regions where manual compression may be difficult, time-consuming, and unsuccessful.

In this case, the procedure was performed in conjunction with an interventional radiologist and the breast radiologists involved in the patient's care. With ultrasound used for localization and guidance, the area in the breast was prepared under sterile conditions and injection of thrombin resulted in immediate thrombus formation and closure of the pseudoaneurysm. Minimal invasiveness, avoidance of the operating room, quick recovery time, and lower financial cost to the patient are a few of the benefits of this procedure.

A disadvantage of thrombin use is potential failure of pseudoaneurysm thrombosis. In retrospect, our patient had multiple risk factors that may have predisposed her to pseudoaneurysm formation and bleeding diathesis, including cirrhosis with portal hypertension. This case highlights the importance of thoroughly considering risk factors that may contribute to bleeding diathesis prior to any procedure such as a core biopsy.

Further Reading

- Adler K, Samreen N, Glazebrook KN, Bhatt AA. [Imaging features and treatment options for breast pseudoaneurysms after biopsy: a case-based pictorial review.](#) *J Ultrasound Med.* 2020;39(1):181-190. doi:10.1002/jum.15082
- Bazzocchi M, Francescutti GE, Zuiani C, Del Frate C, Londero V. [Breast pseudoaneurysm in a woman after core biopsy: percutaneous treatment with alcohol.](#) *AJR Am J Roentgenol.* 2002;179(3):696-698. doi:10.2214/ajr.179.3.1790696
- Chetlen AL, Kasales C, Mack J, Schetter S, Zhu J. [Hematoma formation during breast core needle biopsy in women taking antithrombotic therapy.](#) *AJR Am J Roentgenol.* 2013;201(1):215-222. doi:10.2214/AJR.12.9930
- El Khoury M, Mesurole B, Kao E, Mujoomdar A, Tremblay F. [Spontaneous thrombosis of pseudoaneurysm of the breast related to core biopsy.](#) *AJR Am J Roentgenol.* 2007;189(6):W309-W311. doi:10.2214/AJR.05.1647
- Ingram AD, Mahoney MC. [An overview of breast emergencies and guide to management by interventional radiologists.](#) *Tech Vasc Interv Radiol.* 2014;17(1):55-63. doi:10.1053/j.tvir.2013.12.009
- Rumbaut RE, Thiagarajan P. [Platelet-Vessel Wall Interactions in Hemostasis and Thrombosis.](#) Morgan & Claypool Life Sciences; 2010. Accessed January 6, 2021. <https://www.ncbi.nlm.nih.gov/books/NBK53450/>



Most Commonly Used Additional Views, Part 3: Defining Structures and Clarifying Presence of Abnormalities

By Robyn Hadley, RT(R)(M); Dawn Derenburger, RT(R)(M)

In this *Most Commonly Used Additional Views* series, we have discussed “Variations of the Craniocaudal View” and “Minimizing Superimposition and Identifying Location.” Technologists who maintain a strong knowledge of additional views can add value and assist the radiologist in making a definitive interpretation. In this third and final part of the series, we discuss additional views that can help define structures and verify the presence of abnormalities within the breast.

Spot Compression View/Magnification Spot Compression View

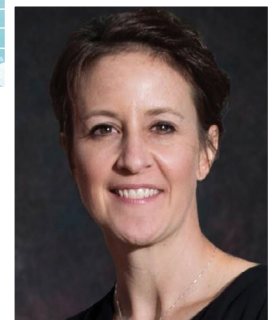
Spot compression and magnification views assess focal areas of interest in the breast. These views are particularly beneficial when the following are necessary^{1,2}:

- Facilitate localized compression
- Minimize superimposition of overlapping structures
- Reduce thickness of the area of interest
- Improve spatial resolution
- Enhance tissue contrast, margin visibility, and image detail
- Increase geometric sharpness
- Reduce noise from scatter radiation^{1,2}

When patients return for additional imaging, the technologist should review the previous images and the radiologist’s recommendations on the initial imaging report. This is an opportune time for the technologist to ask the radiologist any questions regarding the additional imaging. Being proactive and investigating before patient arrival can reduce unnecessary patient exposure and create an efficient process. Having established department-specific protocols for additional imaging scenarios posted in the mammography room(s) is another effective tool to facilitate this process. This information, along with a department-specific procedure manual including all screening and diagnostic protocols, should be reviewed frequently and be readily available for reference. Most importantly, it is essential for the technologist to have a clear understanding of how to precisely and accurately obtain spot compression and magnification views^{1,2}:

- The area of interest is generally noted by the radiologist.
- The location of the abnormality and established department-specific protocols will determine which views will be obtained. The breast localization map (Figure 1) can be used to help select the appropriate view.
- Determine the location of the area of interest. The area of interest can be figured by the following (Figures 2 and 3):
 1. Measure back from the nipple in its axis, posteriorly along the posterior nipple line.
 2. From the imaginary line made in measurement 1, now measure the distance to the lesion.
 3. A third measurement may also be made from the lesion to the skin.
- The technologist must remember that compression must be simulated when locating the area of interest.
- Place the area of interest under the compression paddle and compress the breast.
- Taut compression is essential for optimizing visualization of tissues for spot compression and magnification views.

Manufacturers offer a variety of spot compression devices. The preference for using the small round spot compression paddle versus the square spot compression paddle differs among radiologists and technologists. Compression is applied and measured in pounds per square inch. Therefore, the smaller the area under compression, the more pounds per square inch applied and the greater the separation of tissue. While the larger spot paddle allows reassurance that the area of interest is in the field of view, the smaller paddle provides true focal compression.² To demonstrate this point, an experiment was performed using a phantom created with liquid gel and small radiopaque objects. The phantom position remained stationary while thickness and compression force were kept consistent throughout the exposure(s) (Figures 4 and 5).



Robyn Hadley, RT(R)(M)



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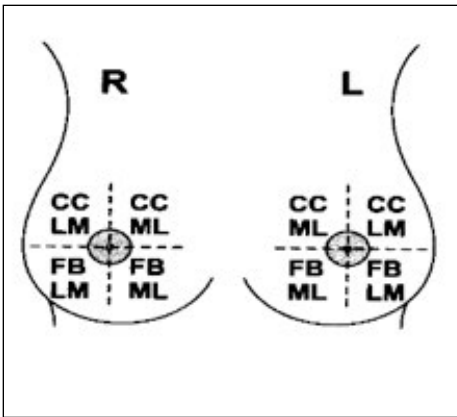


Figure 1. Breast localization map. Image courtesy of Mammography Educators, Louise C. Miller.

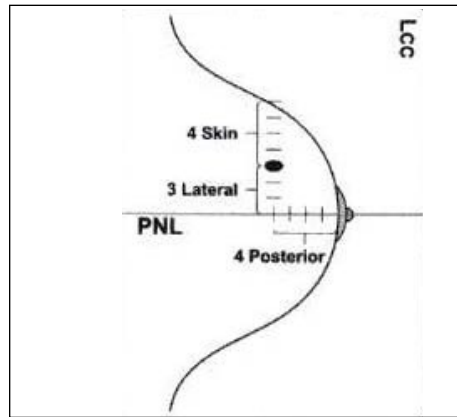


Figure 2. Craniocaudal view spot localization. Image courtesy of Mammography Educators, Louise C. Miller.

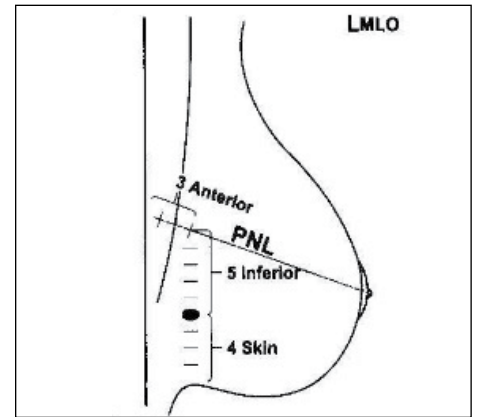
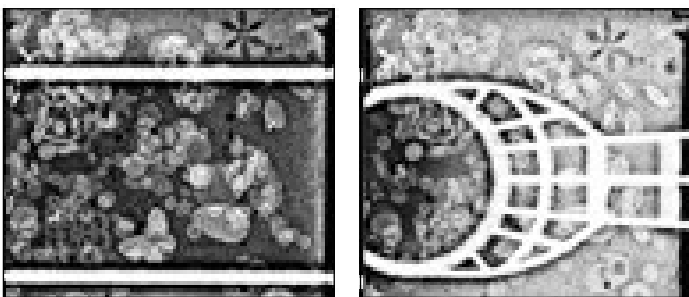


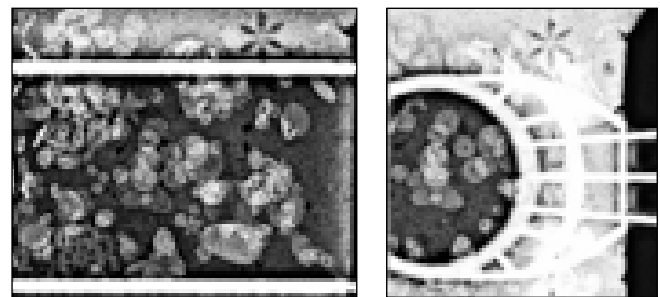
Figure 3. Mediolateral oblique view spot localization. Image courtesy of Mammography Educators, Louise C. Miller.



Square paddle

Round paddle

Figure 4. Compression thickness for both exposures was 23 mm. Note that separation of structures is more effective using the round paddle. Images courtesy of Robyn Hadley, RT(R)(M).



Square paddle

Round paddle

Figure 5. Compression for both exposures was 15 lb. Note that separation of structures is more effective using the round paddle. Images courtesy of Robyn Hadley, RT(R)(M).

The implementation of new technologies and equipment changes warrants consideration for frequent review of department protocols and the requirements of additional imaging. By using knowledge of supplemental views, technologists can contribute to ongoing protocol revisions and updates and, most importantly, can assist their radiologist in answering important questions necessary to help make the appropriate diagnosis.

References

1. Long SM, Miller LC, Botsco MA, Martin LL. *Handbook of Mammography*. 5th ed. Mammography Consulting Services; 2010:51-53,154-170.
2. Kopans D. *Breast Imaging*. 3rd ed. Lippincott Williams & Wilkins; 2005: 316-321.

The Fellows Committee recently approved the applications for 3 new SBI Fellows. This distinction is among the highest honors bestowed on SBI members. Read on to be introduced to our 3 new outstanding fellows, who were officially inducted into fellowship at the virtual SBI Fellows Business Meeting on December 7, 2020.



Carrie B. Hruska, PhD, FSBI, is a professor of medical physics at Mayo Clinic in Rochester, Minnesota, and a member of SBI since 2015. Her clinical areas of expertise are breast imaging and nuclear medicine, and she has dual board certification from the American Board of Radiology in diagnostic medical physics and

nuclear medicine physics. She is an active educator and mentor to students, residents, and technologists. Her academic work has focused on improving imaging technology for breast cancer detection and characterizing imaging features associated with breast cancer risk. She is an author of more than 65 publications related to breast imaging, including many studies evaluating the technology of molecular breast imaging (MBI). Dr Hruska is an inventor, with 4 patents related to MBI technology. Dr Hruska is also a principal investigator of the Density MATTERS trial, which is newly funded by a National Institutes of Health R01 award and is comparing the efficacy of MBI and tomosynthesis for screening women with dense breasts.



Vilett A. Loving, MD, MMM, FSBI, is the chief of breast imaging at Banner MD Anderson Cancer Center in Gilbert, Arizona. Dr Loving received his medical education at the Perelman School of Medicine at the University of Pennsylvania in Philadelphia, Pennsylvania, and he completed his diagnostic radiology residency and

breast imaging fellowship at the University of Washington in Seattle, Washington. He is interested in the intersections of breast radiology with other medical disciplines and actively seeks collaborative projects that expand the scope of the field. Dr Loving

is also interested in investigating how breast radiologists can deliver better service to their patients and referring providers. He supports radiology's pivotal role in health care organizations, and he has fostered a learning culture throughout his organization's medical group by launching several multidisciplinary quality improvement projects. For the SBI, he currently serves as assistant editor of SBI News. Outside of work, Dr Loving enjoys spending time with his family in the Arizona sunshine (always apply sunscreen and wear broad-brimmed hats!).



Jean M. Weigert, MD, FACR, FSBI,

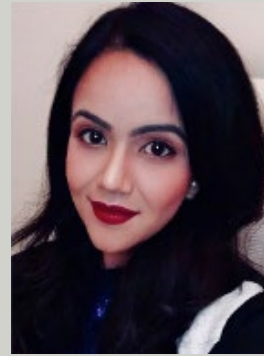
is a breast imaging specialist with Jefferson Radiology, PC, in Hartford, Connecticut. She is a graduate of Wellesley College in Wellesley, Massachusetts, and the State University of New York Upstate Medical Center in Syracuse, New York. She completed her diagnostic radiology

residency and fellowship in abdominal imaging at Columbia Presbyterian Medical Center in New York City. Dr Weigert has been in practice for 35 years. She was the mammography section head at the Hospital of Central Connecticut from 2013 to 2017, was chair of the ACR Accreditation Committee for Mammography from 2015 to 2020, and has been a senior mammography clinical reviewer since 2003. She has been a member of the Committees for Breast Ultrasound, Breast Magnetic Resonance Imaging, and Stereotactic Biopsy, for which she is also a reviewer. She is past president of the Radiological Society of Connecticut and is currently vice president of the National Consortium of Breast Centers. In 2014, she was named the Hartford Business Journal Physician of the Year. Dr Weigert has been involved in breast imaging research and has published papers on MBI and breast ultrasound as an adjunct for women with dense breasts. She has been actively involved in lobbying for legislation in her state of Connecticut and nationally to promote women's health issues, particularly breast cancer and breast imaging. She is a passionate competitive ballroom dancer. She is proud mother of 2 daughters and 3 stepdaughters and grandmother to 6 wonderful grandchildren.

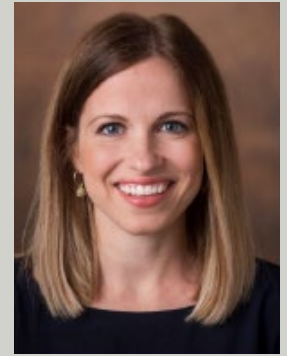
The Newly Formed Young Physician Section: Get Involved Early

By Nidhi Sharma, MD; Katie M. Davis, DO

Thanks to the efforts of Amy Patel, MD, and Naziya Samreen, MD, the SBI has launched an exciting initiative to engage early-career physicians in breast imaging. The Young Physician Section (YPS) was created for all society members who have completed graduate medical training and are in the first 8 years of professional practice or under 40 years of age. The committee is dedicated to enhancing professional development and quality of life for young physicians, fostering involvement in the SBI at large, and providing early-career resources and support to ensure long-term success.



Nidhi Sharma, MD



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A visionary endeavor created by young physicians for young physicians, the section aims to provide scholarly articles, guidance, advocacy, and mentorship. Active participation can help YPS members gain insight into ongoing challenges related to breast imaging and promote career satisfaction. The benefits of SBI membership are many and diverse, and with the formation of the YPS, we hope to play an important role in advocating on behalf of all early-career physicians in the field.

Looking forward, we plan to stay true to our mission of leadership development and mentorship. Recognizing the key role that expert mentorship plays in young physicians' success, the YPS is diligently working with the SBI Membership Committee toward a mentorship program. Another YPS goal is delivering access to early-career resources. We will highlight several newsletter issues, a new web

page dedicated to YPS, multiple curated electronic resources, and educational presentations. We strive to build a strong support network that will achieve far greater outcomes together than alone. We aim to champion physician wellness, support improvements in patient safety and quality, and prepare young physicians to shape the future of SBI.

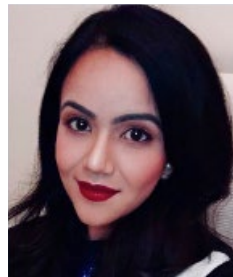
The participation of early-career physicians is fundamental, and your input is greatly valued. Your enthusiasm and engagement will catalyze the growth and development of young physicians within the society. The YPS Committee welcomes your input on the SBI Connect platform. We are committed to helping our early-career peers and would love to hear your ideas so that we can best serve you. We look forward to the future and hope that you will join us by becoming an active member of the YPS.



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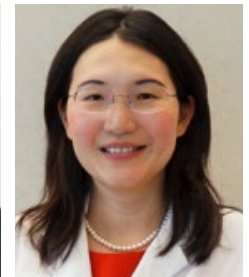
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Phase-Contrast Imaging for Breast Cancer: A “Shift” Toward a Bright Technology?

By Sarah Lewis, PhD, MEd, BAppSci(DR)(Hons)

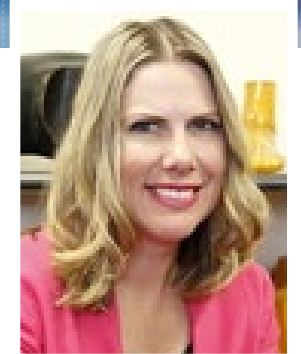
Phase-contrast imaging is an imaging technique using ionizing radiation, primarily with synchrotron radiation but also with compact light sources. Phase-contrast tomography (PCT) significantly improves image quality because it uses information not only from conventional x-ray attenuation but also from x-ray refraction, or shift. PCT offers maximum benefit for soft-tissue structures that require differentiation to detect disease. Recently, research has progressed from using phantom tools to using human tissue, including excised lesions and whole mastectomy samples. Radiological evaluation has demonstrated that PCT using synchrotron radiation provides superior image quality of breast tissue as compared with absorption-based and cone-beam computed tomography (CT) at a comparable or lower dose. So are we ready to embrace this new technology, and what are the barriers to implementing PCT in practice?

What Is Phase-Contrast Imaging?

While all conventional x-ray-based imaging technologies rely on differences in soft-tissue x-ray attenuation (ie, absorption contrast), phase-contrast x-ray imaging techniques have the additional capacity to visualize variations in x-ray refraction, also known as *shift*. For typical medical imaging x-ray energy ranges, the refraction effects contain more soft-tissue information than do the absorption effects, but visualizing refraction is less straightforward.¹ Five phase-contrast x-ray imaging techniques have been evaluated for breast imaging,² but 4 of them use specialized x-ray optical elements and/or have expensive or impractical technical requirements, making their introduction into the clinic problematic.

On the other hand, the most promising phase-contrast technique, propagation-based phase-contrast imaging (PB-CT), only requires a spatially coherent x-ray beam (achieved by means of synchrotron or microfocus x-ray sources), a relatively long sample-to-detector distance (to improve signal to noise ratio), and the use of special phase-retrieval algorithms as part of the image analysis (Figure 1).² Breast imaging has much to gain from x-ray phase-contrast techniques because the maximum advantage over conventional absorption-based imaging occurs where tissue contrast is low (ie, in the breast), the required spatial resolution is relatively high, and cancer detection is a highly challenging visual task.³ This perfectly

describes the imaging limitations of full-field digital mammography (FFDM) and digital breast tomosynthesis (DBT), in which superimposition can mask cancer detection and compression often causes discomfort or pain.



Sarah Lewis, PHD, MED, BAPPSCI(DR)(HONS)

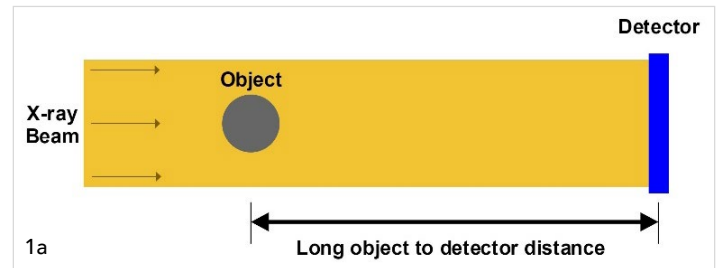


Figure 1. A simple schematic diagram of propagation-based phase-contrast imaging.²

Salient PCT Research to Date for Breast Imaging

Successful research with PCT (or PB-CT) of breast tissue has been emerging worldwide, with 2 international teams from Australia and Italy leading the way.^{4,5} Working together, we succeeded in visualizing refraction simply and effectively both in fresh breast cancer specimens and in whole mastectomy specimens, with 95 whole mastectomies of cancer and disease-free breasts being imaged to date. Our published results show that this technology can significantly improve radiological image quality at similar or lower doses than are used in absorption-only techniques (eg, FFDM, DBT, and absorption-based CT) (Table).^{5,6} Our most recent study using 12 fresh breast mastectomy samples and visual grading characteristic analysis showed that for the dose equivalent to current standard-of-care in vivo breast imaging, PCT resulted in significantly superior image quality as compared with cone-beam-based CT ($P \leq .001$) (Figure 2).⁷ This work has been led by Professor Patrick Brennan (University of Sydney, Australia), Professor Timur Gureyev (University of Melbourne, Australia), Dr Seyedamir Tavakoli Taba (University of Sydney), Dr Daniel Hausermann (principal scientist for the imaging and medical beamline [IMBL] at Australian Synchrotron, Australia), Professor Giuliana Tromba (Elettra Sincrotrone, Trieste, Italy), and Professor Renata Longo (University of Trieste, Italy).



Table. Optimum imaging conditions for PB-CT at the IMBL, Australian Synchrotron

PARAMETER	OPTIMUM CONDITIONS FOR AVERAGE BREAST SIZE
X-ray energy	Monochromatic x-ray energy of 32 keV
Propagation distance	Large propagation distance (6 m) between the sample and the detector at Australian Synchrotron
Detector	Low-noise, high-sensitivity x-ray detector with an area of at least $14 \times 14 \text{ cm}^2$, pixel size of $50 \times 50 \mu\text{m}^2$, and frame rate of 30 frames per second or higher
Phase retrieval and CT reconstruction	Homogeneous transport-of-intensity equation-based phase-retrieval technique as part of the specialized PB-CT image reconstruction. CT: iterative filtered back-projection.

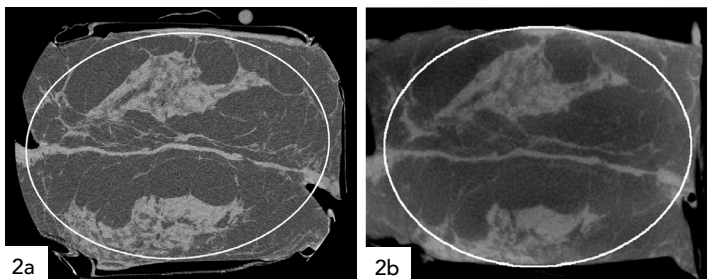


Figure 2: Ductal carcinoma in situ, grade 2; size, 13 cm \times 18 cm. Figure 2a: PBCT, 35 keV and 9-m sample-to-detector distance. Figure 2b: Koning CBCT. Both images approximately 5.8 mGy. PBCT image is courtesy of Elettra Sincrotrone Trieste, Italy.

Are Humans and Infrastructure Ready?

A number of important infrastructure and simulation components are necessary to realize the potential of clinical trials with PCT. These include optimization of synchrotron hardware, including detectors, a rotating bed, and breast immobilization devices.⁸ Similar to breast CT or magnetic resonance imaging, PCT requires the woman to lie prone on a supported or suspended table that rotates through the stationary beam. Only 1 breast can be imaged at a time, with light immobilization necessary to control involuntary movement of the breast as the table completes an arc with an image time of 20 to 30 seconds. Phantom simulations are currently under way to solve complex issues such as motion correction, image reconstruction, and minimization of artifacts related to table infrastructure. Although progress has slowed because of the coronavirus disease 2019 pandemic's restrictions on elective surgery, the Australian Synchrotron clinical trial will resume in late 2020 with recruitment of healthy women to participate in simulations of table movement and to evaluate the facility in terms of physical and emotional comfort. Following this, women with recently diagnosed breast cancer who are scheduled for mastectomy will be invited to take part in the trial, including irradiation of their breasts to correlate with mammographic findings.

One of the most important parts of translating PCT to the clinic is developing reader expertise. Because PCT images are new to most radiologists, the next 12 months will see an educational intervention to assist radiologists in recognizing the radiological features of cancer in PCT and also a receiver operating characteristic curve study now that sufficient cancer-free cases have been acquired

(via prophylactic mastectomies). With over 100 current cases, we have been able to construct test sets that have a range of normal, normal variant, and cancer-containing features as well as the full range of mammographic breast densities. The receiver operating characteristic curve will be an important indicator of performance because we have validated PCT as being of superior image quality at the same or lower dose than that of 2-dimensional mammography and breast CT.

So What Is Next?

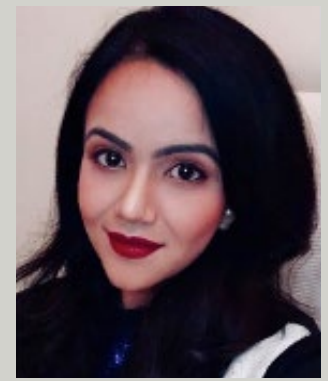
In recent years, PCT has rapidly progressed toward clinical translation as an advanced imaging technology for breast cancer diagnosis and is ready to be embraced by the adventurous radiologist. Advances in the technical development of compact microfocus x-ray imaging have been made, addressing the need for high-spatial-coherence x-rays at a room-size footprint. The future of PCT is bright. PCT has the potential to produce exquisite spatial resolution of breast cancers, which may translate into better patient outcomes.

References

1. Raupach R, Flohr T. [Performance evaluation of x-ray differential phase contrast computed tomography \(PCT\) with respect to medical imaging](#). *Med Phys*. 2012;39(8):4761-4774. doi:10.1118/1.4736529
2. Taba ST, Gureyev T, Alakhras M, Lewis S, Lockie D, Brennan PC. [X-ray phase-contrast technology in breast imaging: principles, options, and clinical application](#). *AJR Am J Roentgenol*. 2018;211(1):133-145. doi:10.2214/AJR.17.19179
3. Castelli E, Tonutti M, Arfelli F, et al. [Mammography with synchrotron radiation: first clinical experience with phase-detection technique](#). *Radiology*. 2011;259(3):684-694. doi:10.1148/radiol.11100745
4. Baran P, Pacile S, Nesterets YI, et al. [Optimization of propagation-based x-ray phase-contrast tomography for breast cancer imaging](#). *Phys Med Biol*. 2017;62(6):2315-2332. doi:10.1088/1361-6560/aa5d3d
5. Tavakoli Taba S, Baran P, Lewis S, et al. [Toward improving breast cancer imaging: radiological assessment of propagation-based phase-contrast CT technology](#). *Acad Radiol*. 2019;26(6):e79-e89. doi:10.1016/j.acra.2018.07.008
6. Pacile S, Dullin C, Baran P, et al. [Free propagation phase-contrast breast CT provides higher image quality than cone-beam breast-CT at low radiation doses: a feasibility study on human mastectomies](#). *Sci Rep*. 2019;9(1):13762. doi:10.1038/s41598-019-50075-6
7. Tavakoli Taba S, Baran P, Nesterets Y, et al. [Comparison of propagation-based CT using synchrotron radiation and conventional cone-beam CT for breast imaging](#). *Eur Radiol*. 2020;30(5):2740-2750. doi:10.1007/s00330-019-06567-0
8. Lewis SJ, Tam N, Arana Pena LM, et al. Getting a-breast of immobilisation needs for the implementation of phase contrast tomography. In: Bosmans H, Marshall N, Van Ongeval C, eds. *Proceedings Volume 11513: 15th International Workshop on Breast Imaging (IWBI2020)*. Society of Photo-Optical Instrumentation Engineers; 2020;115131P. <https://doi.org/10.1117/12.2563572>

Radiological Society of North America 2020 Annual Meeting Review

By Nidhi Sharma, MD



Nidhi Sharma, MD

The 106th Scientific Assembly and Annual Meeting of the Radiological Society of North America (RSNA) transpired in a well-executed virtual fashion on an online platform from November 29 to December 5, 2020.

Hundreds of outstanding presentations on groundbreaking research and technology, including artificial intelligence (AI), innovative technologies, 3-dimensional printing, and virtual networking events, highlighted this year's annual meeting, with the theme "Human Insight/Visionary Medicine." Newer AI innovations were showcased throughout the meeting and in the AI virtual theater.

The meeting began on Sunday morning with an opening plenary session by RSNA President Dr James Borgstede, professor of radiology at University of Colorado, Denver; Gold Medal awardee and recipient of the William T. Thorwarth Award for Excellence in Economics and Health Policy by the ACR; and RSNA Honored Educator in 2019. He addressed the meeting with a presentation titled "One World, One Radiology Community—A Vision for Tomorrow," emphasizing the vision of a collaborative, equitable radiology world encouraging radiologists to make conscious choices on worldwide collaboration and globalization as next steps to advancement of the field. This was followed by a highly impactful opening plenary lecture by Dr Kristen DeStigter titled "The Power of Radiology to Drive Collective Action and Transform Global Health." She highlighted the role of collaborative focus on capacity building and capability strengthening through research, education, mentorship, and advocacy and emphasized the importance of effective partnerships to improve equitable access to radiology services.

RSNA dedicated the scientific assembly program to the memory of Robert E. Campbell, MD, an esteemed radiologist, stalwart RSNA past president, and compassionate educator who dedicated his career to advancing radiology at the University of Pennsylvania. This year's Outstanding Educator award was given to Mark E. Mullins, MD, PhD, prolific author, researcher, expert neuroradiologist, and professor of radiology and imaging sciences at Emory University School of Medicine, Atlanta, Georgia. Victoria L. Mango, MD, of Memorial Sloan Kettering Cancer Center, New York, New York, was one of the Quality Improvement award winners for her work "Decreasing Benign Breast Ultrasound Biopsies: Prospective Use of AI Decision Support." The Outstanding Researcher award was given to David Mankoff, MD, PhD, one of the foremost authorities in molecular imaging. His key research achievements are in the field of breast imaging, including defining applications of ^{18}F -fludeoxyglucose-positron emission tomography to breast cancer staging, in vivo biology of cancer metabolism, and estrogen receptor expression in breast cancer using positron emission tomography.

RSNA's highest honor, the Gold Medal awards, were given to 3 renowned leaders who each have contributed significantly to the advancement of our field. Ronald L. Arenson, MD, William T. Thorwarth Jr, MD, and Kay H. Vydareny, MD, were the esteemed recipients of this honor at the 106th Scientific Assembly and Annual Meeting.

The 2020 virtual RSNA meeting was abound with novel breast imaging presentations and refresher courses. The wide variety of topics displayed in exhibits and scientific presentations in breast imaging were executed flawlessly despite the virtual platform, which gave the audience the opportunity to attend contemporaneous sessions on their own time. The assortment of topics included AI, radiogenomics, and newer applications of various imaging modalities in breast imaging.

The keynote breast imaging presentation by Fiona Gilbert, MD, focused on assessing the value of AI in breast imaging. A few studies focused on the role of AI algorithm development for assessment of breast density in 2-dimensional mammography, its role in triaging screening mammograms that would benefit most from double-reading, and reducing workload and increasing performance. Additional presentations highlighted the role of deep learning for digital mammograms of patients with BI-RADS 4 lesions to potentially avoid unnecessary biopsies while ensuring high sensitivity. Other studies focused on the role of AI in workflow improvement. A dedicated scientific session on essentials of machine learning study design and algorithm validation highlighted a multitude of presentations on advanced validation techniques and their implications for certification and deployment. A rapid-fire breast imaging session on AI had interesting presentations, including an AI model exhibiting comparable and racially unbiased performance in Black and White patients, AI leading to increased radiologist efficiency with reduced turnaround time, the role of AI in reducing interval cancer rates, and AI's impact in decreasing the number of noncancerous biopsies of calcifications, among numerous other exciting research breakthroughs.

Multiple enriching presentations on breast magnetic resonance imaging (MRI) were also a feature of this year's meeting. Stamatia Destounis, MD, FACR, FSBI, elaborated on the role of parenchymal enhancement in providing a clue to breast cancer risk, and Wendy DeMartini, MD, FSBI, highlighted methods to improve MRI accuracy.

Continued on page 21 >



Local Benefits of Being a Member of the SBI

By Anand Narayan, MD, PhD

One of the unique benefits of membership in the SBI is the opportunity to connect with breast radiologists in your community. As a member of the SBI Membership Committee and cochair of the Massachusetts Radiological Society Breast Imaging Subcommittee, I worked with the Massachusetts Radiological Society to organize events to help breast radiologists in the New England area. In October 2019, a team of breast imaging fellowship directors in the Boston area held a career networking event to support breast imaging fellows.



Anand Narayan, MD, PhD

Through the SBI, employers in New England were given the opportunity to interact with Boston-area trainees. The event began with a panel discussion led by practice leaders in academic, private, and hybrid practices, followed by small-group networking sessions. Here the trainees had the opportunity to directly interact with practice leaders in the New England area. In October 2020, the team came together for the second annual career networking event, conducted virtually because of the pandemic. Similar to the preceding year, the event began with a panel discussion, followed by teleconference breakout sessions in which trainees were able to interact directly with practice leaders. Overall, these sessions provided opportunities for SBI members in the New England area to connect with the next generation of breast radiologists.

Working with the Massachusetts Radiological Society, we were able to organize a virtual coronavirus disease 2019 (COVID-19) breast imaging event to highlight the extensive resources developed and curated by the SBI to help practices navigate through

COVID-19 limitations. Through SBI email advertisements, breast radiologists in New England were made aware of opportunities to hear best practices from practice leaders and quality and safety experts in Massachusetts. Overall, this session provided New England SBI members with cutting-edge information about COVID-19 resources from the SBI.

All of these events emphasize the ways in which being a member of the SBI provides unique opportunities to connect with local colleagues to share information. The SBI offers several communication channels to connect with colleagues: the SBI email distribution list, complimentary webinars, access to the SBI Connect forum, the society's all-new members-only online community, weekly member update e-blast, and the quarterly newsletter. Members who are interested in local outreach opportunities should contact Anand Narayan (aknarayan@mgh.harvard.edu) or Sarah Avery (averysmd@ausrad.com) to find out how you can connect with SBI members in your community.

Radiological Society of North America 2020 Annual Meeting Review (continued from page 20)

Some studies focused on clinical management, like the role of preoperative breast MRI in patients younger than 35 years in detection of additional synchronous malignancies, helping with surgical outcomes. A study on ultrafast dynamic contrast-enhanced MRI demonstrated its usefulness in differentiating breast carcinoma from benign lesions. The ECOG-ACRIN E4112 multicenter trial results showed that preoperative MRI demonstrated larger ductal carcinoma in situ (DCIS) span than mammography and identification of additional malignancy in DCIS evaluation. Another study evaluated the role of diffusion-weighted imaging for detection of clinically occult early breast cancer and showed better detection than mammography regardless of lesion size, histopathology result, or molecular subtype. Bethany Niell, MD, presented data on her study revealing that intratumoral perfusion heterogeneity on dynamic contrast-enhanced breast MRI was predictive of pathologic complete response in patients undergoing neoadjuvant chemotherapy. Another interesting study concluded that tumor size larger than 5 cm and presence of peritumoral edema on preoperative breast MRI

were independent variables predicting recurrence in young breast cancer patients.

Even amidst a global pandemic, RSNA left no stone unturned in making this virtual scientific assembly a huge success. There were numerous online networking events, breakout rooms, online vendor booths, Q&A chats during and after each presentation, and innumerable outstanding presentations to learn from at this tremendously executed virtual exposition. Even though we may have missed the electrifying atmosphere of McCormick Place and connecting with our friends, alumni, and radiology community in person, this was a thoroughly gratifying experience. I look forward to attending next year with thousands of radiologists from our worldwide community, taking a chilly evening stroll across the iconic Navy Pier, and adding a finishing touch by soaking in the magnificent city views from the incredible rooftop observation deck at John Hancock Center. Ah Chicago!

The Canadian Society of Breast Imaging

By Jean Seely, MD, FSBI; President, Canadian Society of Breast Imaging (Twitter: @JeanSeely)



Jean Seely, MD, FSBI

So much has happened since the coronavirus disease 2019 (COVID-19) pandemic first affected us over 8 months ago. Despite the losses we have all experienced, we have good reasons to celebrate our accomplishments during this time. Despite the marked change in our lives, Canadian Society of Breast Imaging (CSBI) membership remains strong with 110 members. Membership is free for students, residents, and fellows. Our highly engaged board of directors includes Dr Nancy Wadden, Dr Anabel Scaranelo, FSBI, Dr Supriya Kulkarni, Dr Charlotte Yong-Hing, Dr Yves Loisel, and me. We are pleased to have 2 new radiology resident members join our board, Dr Tong Wu (British Columbia) and Dr Wyanne Law (Toronto). Stephanie Schofield recently stepped down from the board. We are very grateful for her work on CSBI. I am delighted to welcome Christie Barbesin, MRT, to the board. She is a very experienced mammography technologist also trained in breast ultrasound, with a passion for education.

Education

Virtual Conference

The Virtual Breast Screening Forum 2020 (#BreastScreeningForum2020) was held with the British Columbia (BC) Radiological Society and BC Cancer Breast Screening Program on June 27, 2020. After having to cancel the in-person forum scheduled in May, we held a 1-day virtual conference instead. Focusing on breast cancer screening, Dr Linda Warren, FACR, FSBI, provided the history of mammography screening in Canada, and speakers Dr Ed Sickles, FSBI (United States), Dr Adam Yala (Massachusetts Institute of Technology), Dr Huiming Yang, Dr Nancy Wadden, Dr Martin Yaffe, FSBI, Dr Paula Gordon, FSBI, Dr Jean Seely, FSBI, and Dr Miranda Miocevic (Australia) gave informative talks on implementation and politics of screening, artificial intelligence, recall rates in mammography, and ultrasound and magnetic resonance imaging (MRI) screening. With over 200 registrants, the virtual conference was a first for the CSBI and a resounding success! The recorded presentations have been made available online for free to CSBI members and conference registrants on the new [virtual library platform](#), which launched in October.

Virtual Webinars and Tomosynthesis Workshops

Dr Kulkarni gave a popular 3-hour online tomosynthesis workshop on September 19, 2020. With 24 registrants from across Canada, demand was exceeded and other radiologists attended the second workshop, held in January 2021. Other virtual education webinars have been successful, including one on the importance of clip placement after biopsy (Dr Yong-Hing). There will

be more to come in French and English.

CSBI 2021 Conference

The conference will be held virtually, the date to be determined. The planning committee has started work on this!

Connection

Let's Chat Meetings

The pandemic placed a high priority on improved communication, particularly in the first few months, when ensuring patient and provider safety was of critical importance. To address this need, CSBI provided free online chat groups for radiologists and technologists. Five 1-hour calls with 20 to 40 people were held between March 24 and May 20, 2020, and allowed everyone to share best practices to improve safety and workflow during the pandemic.

Working Groups

Breast MRI Working Group

This group has made excellent progress. Since January 2020, it has spearheaded 3 separate surveys for the public, MRI sites in Canada, and radiologists. The surveys were completed for the public and MRI sites, and the radiologists' survey will be distributed soon. Based on the information gathered, the working group will provide recommendations for ways to improve breast MRI access, such as shortened MRI protocols.

Training Committee

Our residents' board members, Drs Tong and Law, are heading a committee for trainees in breast imaging. A [survey](#) of trainees' needs will be distributed to all Canadian radiology residents and will help inform recommendations for access to breast imaging training.

Advocacy

COVID-19

CSBI collaborated with the Canadian Association of Radiologists to generate position statements and recommendations during the pandemic:

- March 16, 2020: [Canadian Society of Breast Imaging and Canadian Association of Radiologists Joint Position Statement on COVID-19](#)
- April 2, 2020: [The Canadian Society of Breast Imaging \(CSBI\) and the Canadian Association of Radiology \(CAR\) Guidelines for Breast Imaging during the COVID-19 Pandemic](#)



- May 26, 2020: [COVID-19: Safe Guidelines for Breast Imaging During the Pandemic](#), published in *Canadian Association of Radiologists Journal*

Canadian Partnership Against Cancer

CSBI is supporting the Public Health Agency of Canada (PHAC) initiative to address rising abnormal recall rates in screening mammography in Canada. The PHAC [report](#) showed that abnormal recall rates have risen in the past 5 years despite maintaining the same cancer detection rates. Education is needed to raise awareness and identify factors that contribute to the increased rates.

Canadian Association of Medical Radiation Technologists

The Canadian Association of Medical Radiation Technologists (CAMRT) embarked recently on a pilot project to evaluate advanced practice medical radiation technologists in breast im-

aging. This has been used in other jurisdictions, such as the United Kingdom, and is being considered in Canada. CSBI has been asked by CAMRT to provide input and will help define whether this is feasible and justifiable.

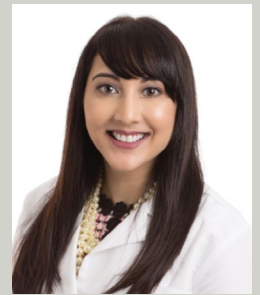
Social Media

Our communications team has been highly active on social media on behalf of CSBI. While counting as the third largest Twitter account for radiology in Canada, @CanadaSBI, they added web pages on Facebook, Instagram, and LinkedIn. Recently they posted [surveys](#) of CSBI for members' needs assessments. We welcome your input. For October, important facts about breast cancer and early detection were posted each day on social media for the public. We are proud that our inaugural video on this site is "Breast Screening: Getting it Right." Check it out on the [CSBI new YouTube Channel](#).

Advocacy: Breaking Down the Legislative Whirlwind of 2020 and Beyond

By Amy K. Patel, MD (Twitter: @amykpatel)

If the unprecedented COVID-19 pandemic was not enough, 2020 brought seemingly insurmountable battles on the legislative front whose end results, thankfully, were a miracle given where we began.



Amy K. Patel, MD

The legislative session resulted in the passage of the Consolidated Appropriations Act, 2021 (omnibus and coronavirus relief bill). This omnibus spending bill included provisions that directly affect the patients we serve and the profession of radiology. Initially, radiology was facing an overall 10% cut in Medicare reimbursement for 2021 to achieve budget neutrality because of the increase in reimbursement allotted to physicians who use E/M codes. This would have resulted in one of the most drastic cuts in radiology reimbursement the field has ever seen. However, our incredible and tireless ACR Government Relations Team initiated a multisociety effort across the house of medicine representing more than a million providers, and many radiologists throughout the country fought vociferously. Our voices were heard through Radiology Advocacy Network calls to action, direct phone calls to elected federal officials, and direct virtual appointments with congressional staff. The effort also included a provision that would waive budget neutrality, allowing reimbursement increases for some providers without decreasing reimbursement for others. As a result, the overall cut was diminished to 4% with further phase-in adjustments later. This cut will be reevaluated in 2022, when it could potentially be deepened. For now, amid a raging pandemic, this was a resounding victory for the house of radiology given where we started in the negotiations.

The bill also included a significantly improved "surprise medical billing" portion that ensures consumers are not held accountable for unexpected medical bills and offers an equitable process to resolve provider-insurer disputes. The ACR championed the push for these provisions.

Another huge victory for our patients was the extended moratorium for screening mammography access beginning at age 40 years from December 31, 2021, to December 31, 2022. This was a result of the aforementioned bill secured by the ACR, SBI, patient advocates, and others. This extension ensures that women aged 40 years and older who want annual screening mammography will retain insurance coverage without any copayments.

Along the same lines, the US Preventive Services Task Force (USPSTF) is going to reevaluate and issue new breast screening guidelines, which have not been evaluated since 2016. The recommendations are crucial as they can affect how the private insurance sector reimburses mammography screening. Currently, the USPSTF recommends screening mammography every 2 years beginning at age 50 years and only advises that women consult their providers to explore screening in their 40s. The hope is that more recent research and evaluation of broader data that include minority populations will reconfirm the scientific evidence we know to be true: annual screening mammography in average-risk women beginning at age 40 years saves the most lives and life-years, and the benefits of receiving lifesaving screenings outweigh the harms.

While we have scored another win for radiology, these trials and tribulations highlight the increasing uncertainty and competitiveness of the future of health care. We must all take it upon ourselves to engage, educate, and advocate when we are called upon to fight the good fight.

What's New in the News: Continued Advances in Artificial Intelligence Take Center Stage at RSNA 2020

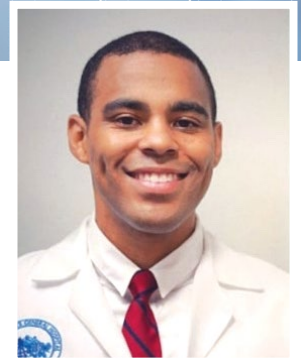
By Randy C. Miles, MD, MPH (Twitter: @RMilesMD)

Although the 2020 Radiological Society of North America conference shifted to a virtual format this year, advances in artificial intelligence (AI) in breast imaging remained center stage. Here are some of the projects presented this year during the meeting.

Lotter and Sorenson, from DeepHealth, presented the performance of their mammography AI model in Black and White patients.¹ While prior AI applications in mammography have shown promising results, variable performance has been demonstrated in racial subgroups. The researchers sought to compare the performance of their model in Black and White patients by retrospectively evaluating screening studies collected across 85 clinical sites in the United States from 2009 to 2020. Self-reported patient race was obtained in a data set consisting of 2995 studies (including 406 cancers) from Black patients and 2439 studies (including 384 cancers) from White patients. Their model exhibited an area under the curve (AUC) of 0.898 across their entire data set, an AUC of 0.901 among Black patients, and an AUC of 0.894 among White patients. Overall, no difference in performance between Black and White patients was observed, demonstrating racially unbiased AI that could be applied to improve mammography interpretation performance in diverse patient groups. In the future, access will be the next issue to be solved to ensure that all women benefit from these technologies.

Sharma et al, from Leeds Teaching Hospital NHS Trust, United Kingdom, evaluated the impact of AI as a second reader in a national breast screening program.² Double reading of screening mammography is the standard of care in many countries. Their study explored the use of an AI product to replace the second human reader. They evaluated mammograms from 3 breast screening centers from 2012 to 2019. Each center employs double reading, with arbitration of discordant results by either a single third human reader or a group of readers. To simulate double reading, the results of the AI algorithm were paired with the opinion of the first human reader. When the AI algorithm was applied as the second reader to the test set, consensus to either recall or not recall cases was found in 33,255 of 40,588 reads (81.9%), and 7333 of 40,588 reads (18.1%) were discordant. The AI algorithm had a sensitivity of 85.5% and a specificity of 87.2%. Combining the AI algorithm with the first reader gave a sensitivity of

95.0%, specificity of 96.9%, cancer detection rate of 8.4 per 1000, and recall rate of 4%. Using the AI algorithm to replace the second human reader may provide a solution for an otherwise labor-intensive task while improving workflow efficiency if only discordant cases require arbitration by an additional human reader.



Randy C. Miles, MD, MPH

Lamb et al, from Massachusetts General Hospital, Boston, presented “A Deep Learning Model Used to Triage Screening Mammograms: Impact of False Negative Threshold Selection on Radiologist Workload and Diagnostic Performance.”³ Although mammography screening is the only modality proven to reduce breast cancer mortality, it remains an imperfect test. The group assessed the impact of varying deep learning model false-negative thresholds on radiologist workload and mammography screening performance metrics. Their deep learning model was developed using consecutive bilateral screening mammograms from 80,818 patients from 2009 to 2016. They created a deep learning workflow to simulate a process in which radiologists selected a threshold corresponding to a desired false-negative rate (FNR) of 0.5, 0.8, or 1.0 per 1000 mammograms. This threshold also determined which mammograms were determined to be cancer-free and therefore not interpreted by the radiologist in a simulated workflow. Radiologists obtained a sensitivity of 91% and specificity of 94% evaluating studies without use of the AI model. In the deep learning simulated workflow with the FNR set at 0.5, radiologists read 56.9% of examinations with a sensitivity of 86% and specificity of 96%; with the FNR set at 0.8, radiologists read 40.2% of examinations with a sensitivity of 82% and specificity of 97%; and with the FNR set at 1.0, radiologists read 34.3% of examinations with a sensitivity of 80% and specificity of 97%. Compared with outcomes without deep learning triage, all simulations resulted in significantly reduced workload and improved specificity. The group concluded that programs could apply AI models to select FNR thresholds to achieve desired outcomes in balancing reduced false-negative and false-positive examination results.



Rodriguez-Ruiz et al, from Radboud University Medical Center, the Netherlands, evaluated whether AI could help increase the positive predictive value (PPV) of screen-recalled biopsies on calcifications.⁴ Their group looked at a consecutive sample of 17,886 screening digital mammograms acquired from a single institution that follows biennial screening with independent double reading. An AI system automatically analyzed each screening mammogram and assigned AI examination scores ranging from 1 to 10, with higher values representing a higher likelihood of malignancy. The numbers of biopsies proven to contain high-risk, malignant, and benign calcifications were calculated. Of 108 biopsies in women with calcifications, 31 were malignant (PPV₂ = 28.7%), 65 were benign, and 12 were high-risk lesions. Of the 31 malignant calcifications, 30 (97%) had an AI examination score of 10. Using a simulated workflow, if only lesions with an AI examination score of 10 were biopsied, the number of benign biopsies would have been reduced by 23.1%.

Bravo et al, also from Radboud University Medical Center, evaluated the impact of AI decision support on breast cancer screening interpretation with single-view, wide-angle digital breast tomosynthesis (DBT).⁵ Their goal was to compare radiologists' accuracy when reading single-view, wide-angle DBT images with and without an AI system for decision and navigation support. The study was a multireader, multicase observer study performed on bilateral mediolateral oblique views acquired with a wide-angle DBT system along with corresponding synthetic 2-dimensional images. Eight breast radiologists interpreted 190 cases including both DBT stack and synthetic views during 2 sessions separated by at least 4 weeks. The 2 sessions included a random mix of cases that were read with and without AI decision and navigation support. The AI system helped direct readers to the lesion-containing slice when clicking on the AI finding marked on the synthetic view. The AUC for the average reader was higher when interpreting images with AI support than when reading unaided (0.878 vs 0.843). In addition, with AI support, readers spent less time on cases assessed by the AI system as low suspicion and more time on those assessed as high suspicion. Radiologists also improved their cancer detection performance when interpreting DBT using the AI system for decision support. The study showed that AI support could result in more optimal distribution of reading time, with readers spending less time on cases with no cancer and more time on suspicious cases.

Ananthasivan et al, from Manipal Hospital, India, presented the impact of AI in reducing radiologist reporting turnaround times.⁶ Their group evaluated AI use in screening mammogram reporting, which may improve radiologist turnaround time

for this repetitive and often time-consuming task. Four radiologists with varied experience were monitored during routine mammography-reporting sessions for mean reporting time per case and number of studies reported per hour. Four weeks later, the same cases were presented to the radiologists along with AI inputs. A total of 3042 studies were reported among the 4 radiologists. The mean times for reporting a mammography study without and with AI assistance were 6 and 4 minutes, respectively, and the numbers of cases reported per hour without and with AI assistance were 10.75 and 15.5, respectively. There was an overall 47% improvement in radiologist efficiency with use of their AI algorithm.

Continued advances in AI in breast imaging will provide more opportunities for radiologists to improve interpretive performance and workflow efficiency. Breast radiologists will be essential in providing insight on the appropriate application of these tools to optimize patient care and health outcomes. While further study is needed, particularly in real-world settings, an exciting future is ahead.

References

1. Lotter W, Sorenson G. Mammography AI model exhibits comparable performance in Black and White patients. Presented at: Radiological Society of North America 2020 Scientific Assembly and Annual Meeting; November 29 to December 5, 2020.
2. Sharma N, James J, Khara G, et al. Impact of an artificial intelligence (AI) solution as a reader in a national breast screening programme. Presented at: Radiological Society of North America 2020 Scientific Assembly and Annual Meeting; November 29 to December 5, 2020.
3. Lamb L, Lehman C, Yala A, et al. A deep learning model to triage screening mammograms: impact of false negative threshold selection on radiologist workload and diagnostic performance. Presented at: Radiological Society of North America 2020 Scientific Assembly and Annual Meeting; November 29 to December 5, 2020.
4. Rodriguez-Ruiz A, Karssemeijer N, Balta C, et al. Can AI help to increase the positive predictive value of screen-recalled biopsies on calcifications? Presented at: Radiological Society of North America 2020 Scientific Assembly and Annual Meeting; November 29 to December 5, 2020.
5. Bravo M, Mann R, Rodriguez-Ruiz A, et al. Impact of artificial intelligence decision support on breast cancer screening interpretation with single-view wide-angle digital breast tomosynthesis. Presented at: Radiological Society of North America 2020 Scientific Assembly and Annual Meeting; November 29 to December 5, 2020.
6. Ananthasivan R, Raj V, Prabhakaran H, et al. Impact of artificial intelligence (AI)/ machine learning supported mammography reporting on radiologist reporting turn around times. Presented at: Radiological Society of North America 2020 Scientific Assembly and Annual Meeting; November 29 to December 5, 2020.



MARK YOUR CALENDAR

Upcoming Events

Some events may be tentative, depending on the status of the COVID-19 pandemic. Please check event websites for updates.

December 15, 2020

Registration Open for the [2021 SBI/ACR Breast Imaging Virtual Symposium](#)

March 27, 2021

[Toronto Breast Imaging Conference](#)

April 9-11, 2021

[2021 SBI/ACR Breast Imaging Virtual Symposium](#)

April 16-19, 2021 online

[Annual Interdisciplinary Breast Center Conference \(NCoBC\)](#)

April 18-22, 2021

[American Roentgen Ray Society 2021 Virtual Annual Meeting](#)

May 15-19, 2021

[ACR 2021 Virtual Annual Meeting \(ACR 2021\)](#)

June 3-5, 2021
Athens, Greece

[IBUS Course 2021 - Multimodality Breast Imaging and Image-Guided Interventions](#)

Please visit the SBI Calendar of Events at www.sbi-online.org for a complete listing of events.