Spring | 2022

SBI NEWS

The Member Newsletter of the Society of Breast Imaging

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SBI IDEA - INCLUSION DIVERSITY EQUITY ALLIANCE: BUILDING A STRONGER TOMORROW

Screenshot from the webinar "Culturally Competent and Individualized Breast Care for the African- American Patient," February 23, 2022, hosted by the SBI Inclusion Diversity Equity Alliance.

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To save lives and minimize the impact of breast cancer

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Respect for diversity and inclusiveness

Emily Conant,
MD, FACR, FSBI
President of the SBI

When I began drafting this column, we were beginning to shed our masks—at least outdoors! However, over the last weeks, COVID-19 rates have increased across the country, once again increasing anxiety and disruption in our families and communities. In our clinical practices, our imaging volumes have surged and we continue to see the grave consequences of delayed or skipped screening mammograms and diagnostic breast evaluations, accompanied by stories of fear of seeking care due to the pandemic. These delays are impacting not only patient outcomes but also the wellness of our workforce. Our technologists, nurses, trainees, radiologists, and providers have all been experiencing heightened stress and anxiety. We need to work together to improve outreach while building back new, and hopefully even better, breast care pathways combined with wellness for our breast care teams.

On a positive note, we are all looking forward to the upcoming and in-person 2022 SBI/ACR Breast Imaging Symposium, to be held May 16 through 19 in Savannah, Georgia! The automated breast ultrasound and magnetic resonance imaging preconference courses will be held on Sunday, May 15. Don't miss these great additional opportunities. This year's meeting will trial a new hybrid format, so those who are unable to attend the in-person meeting will still have the opportunity to engage in virtual content. Perhaps such hybrid formats will become one of the new norms and positives that have emerged from the pandemic? So far, we have registered over 1000 attendees, evenly split between on-site and virtual registrants (on-site registrants are from the United States and 12 other countries; virtual registrants are from the United States and 34 other countries). Please remember to sign up for the President's Gala evening as well—it is a fundraising event for the society's Research & Education Fund. Dr. John Lewin, who will be our incoming president of the SBI, and the SBI Symposium Program Committee have done an amazing job organizing incredibly timely and comprehensive educational and scientific content. Thank you, Dr. Lewin and the excellent Program Committee members!

In committee news, the new Mentoring Committee (overseen by Dr. Laurie Margolies) distributed a needs assessment survey approximately a year ago, and the results of the survey are guiding a beta testing program to refine the mentoring program. Mentors have been invited and mentees are being actively recruited. Stay tuned for more on this important and exciting initiative. Thanks to all who responded and to the committee for their important and ongoing work.

As the spring and summer begin, so do the exciting offerings of SBI's summer live webinar educational series: "Case-Based Review," by Matt Miller, MD (June 14); "Missed Cancers (DBT/US)," by Michael Taylor-Cho, MD, MPH (June 28); "Breast Imaging in the ER," by Hongying (Heather) He, MD, PhD (July 26); "Review of CEM," by Jordana Phillips, MD (August 2); "Imaging the Reconstructed Breast," by Sujata Ghate, MD (August 16); and finally, "Imaging the Transgender Breast," by Mai Elezaby, MD (August 23). This is a great lineup of excellent educational material.

Finally, I'd like to give a huge shout-out to Dr. Jessica Leung, past president of the SBI, for her impactful service and her continued commitment to SBI in chairing the Membership Committee. Dr. Leung's term as SBI president was especially challenged by those early months of COVID-19 and the disruption of the 2020 SBI meeting. Dr. Leung's long experience and insight into the society has been extraordinarily helpful to me this past year. At the May SBI meeting, we will welcome Dr. John Lewin, newly appointed division chief of breast imaging at Yale University, as the incoming SBI president. Dr. Lewin brings thoughtful insight from his leading roles in both private and academic breast practices, and we look forward to his moving SBI forward in building the diversity and impact of our society. Thank you both, Jessica and John!

Since this is my last newsletter column as SBI president, I would also like to send a HUGE thanks to the amazing staff of SBI administration. Working with you has been not only a delight but also a great professional experience for me. Thank you for all your support and guidance!

And thanks to you, our members, for all your continued support and commitment to our society and breast care. It will continue to be a great honor to work with you toward our shared goal of improving our incredibly dynamic field of breast imaging.

Best regards,

Emily F. Conant MD

Emily Conant, MD, FACR, FSBI
President, Society of Breast Imaging

Editor's Note

By Vilert Loving, MD, MMM, FSBI

The meaning of relativity has been widely misunderstood. *Philosophers play with the word, like a child with a doll. Relativity, as I see it, merely denotes that certain physical and mechanical facts, which have been regarded as positive and permanent, are relative with regard to certain other facts in the sphere of physics and mechanics. It does not mean that everything in life is relative and that we have the right to turn the whole world mischievously topsy-turvy.*

-Albert Einstein[1]

Vilert Loving, MD, MMM, FSBI

Thinking back to discussing special relativity in high school physics class, one may recall the famous thought experiment involving space-traveling twins. One twin launches in a rocket to a distant star at near light speed, while the other twin remains on Earth. Upon returning to Earth, the traveling twin has aged more slowly and is now younger than the earthbound twin. The reason is the different frames of reference. Clocks, and time itself, operate relative to the observer's frame of reference: the traveler twin's frame of reference is different than the earthbound twin's because the former is moving at near light speed relative to the earthbound twin.

This seemingly abstract introduction underscores the importance of frames of reference: how we perceive events can change dramatically depending on the viewpoint from which we observe. As realized by our twin experiment, this conclusion is true even for something as "absolute" as time itself. In breast imaging, there are many viewpoints regarding each issue that is relevant for the field. Salient issues are perceived differently by radiologists, technologists, trainees, patients, nonradiologist providers, insurers, and advocacy groups, among others. These viewpoints are further nuanced, as each stakeholder group varies by its members' demographics and nationality. Part of this newsletter's goal is to highlight these varying viewpoints. Appreciating different viewpoints and standing in the shoes of others better position us to progress with more holistic approaches to problems.

In this *SBI News* edition, we present viewpoints from breast radiology trainees, Canadian breast radiologists, European breast radiologists, medical physicists, early-career radiologists, technologists, and patients. Moreover, by acknowledging the importance of varying viewpoints, the SBI is continuing to explore how it can most effectively communicate regarding breast imaging issues to all engaged stakeholders. To this end, the Inclusion Diversity Equity Alliance (IDEA) was launched in 2020 to ensure that the SBI was meeting the needs of its growing, diverse membership. In this issue, we introduce the IDEA to the newsletter's readers. Moving forward, each SBI newsletter will highlight a different SBI committee, raising awareness of these groups' important work in advancing the breast imaging field.

Finally, the annual SBI/ACR Breast Imaging Symposium will be in person in May of this year! I'm sure many of you are excited to be returning to the new "normal." In this edition, we give you a taste of the conference with a preview Q&A featuring Dr. Gabriel Hortobagyi, Professor, Department of Breast Medical Oncology, the University of Texas MD Anderson Cancer Center, and keynote speaker at this year's symposium. We hope to see many of you either in person or online at this year's meeting.

As always, please write with any questions, comments, or newsletter article ideas: vilert.loving@bannerhealth.com. The SBI Newsletter Committee will consider any article idea for publication. Thank you for your time and attention!

Reference

1. Viereck GS. What life means to Einstein: an interview by George Sylvester Viereck. *Saturday Evening Post.* October 26, 1929:17.

Update From the European Congress of Radiology Overture

By Paola Clauser, MD, PhD, Elisabetta Giannotti, MD, Doris Leithner, MD, Maria Adele Marino, MD, Simone Schiaffino, MD, Thiemo van Nijnatten, MD, PhD, and Mirjam Wielema, MD

While we wait for the European Congress of Radiology (ECR) annual meeting to take place in person in Vienna (July 13-17, 2022), the European Society of Radiology and the ECR Committee gave a sneak peak of upcoming sessions in the online ECR Overture (March 2-6, 2022).

Just a few sessions in ECR Overture were dedicated to breast imaging, but they were all interesting and highly engaging. One of the most successful was the "Pros and Cons" trailer session dedicated to intermediate-risk breast cancer screening.[1] European Society of Breast Imaging (EUSOBI) experts Dr. Ritse Mann and Dr. Marc Lobbes had opposing views for screening with contrast-enhanced magnetic resonance imaging (CE-MRI) and contrast-enhanced mammography (CEM). Both speakers made compelling points. Evidence of the usefulness and cost-effectiveness of MRI in screening for women with extremely dense breast tissue is currently increasing, leading EUSOBI to write a statement supporting the use of CE-MRI in screening for women with very dense breasts.[2] The available evidence supports wider use of CE-MRI in screening, especially with the use of abbreviated protocols, emphasizing the need for radiologists to push decision-makers to ensure MRI availability. Moreover, it is high time to conduct pilot projects to demonstrate that using MRI in screening is not only feasible but also the right way to invest our money, especially considering the number of unindicated MRI examinations that are now performed.

On the other hand, as argued by Dr. Lobbes, CEM is a faster and easier examination to perform and to read. The initial results on its clinical application in screening are promising. However, although strong evidence supports the use of CE-MRI for screening, evidence for the use of CEM for screening is lacking, and the risk related to adverse contrast reactions is slightly higher with iodine-based contrast agents than with gadolinium-based contrast agents. At the end of the session, the arguments brought by Dr. Mann seemed more convincing to the audience, who voted in favor of CE-MRI screening.

Prof. Christiane Kuhl, Prof. Thomas Helbich, and Prof. Volkmar Schulz presented an update on the results of the multicentric collaboration to develop a dedicated breast coil for positron emission tomography (PET)–MRI (the Hybrid Imaging for Breast Cancer project).[3] The aims of this project are to improve the functional information achievable with PET, improve lesion characterization, and use imaging to guide treatment. The speakers discussed the difficulties related to the development of this new technology and the new possibilities using different PET tracers and high-resolution PET-MRI coils.

On Saturday, the focus was all on artificial intelligence (AI), with EUSOBI President Prof. Fiona Gilbert, EUSOBI Young Club (EYC) chair Dr. Paola Clauser, Prof. Katja Pinker, and Prof. Constance Lehman discussing the challenges and value of the introduction of AI in clinical practice.[4] In the foreseeable future, the most helpful application of AI systems will be in improving radiologists' performance and efficiency in screening. From experience with computer-aided detection systems, we should be aware of the possible limitations of AI and the highly variable usefulness of these systems when applied by different radiologists. The technology has advanced significantly compared with computer-aided detection systems, but its benefit for radiologists in screening has yet to be determined. Before widely introducing AI, careful post-market evaluations and rigorous prospective scientific studies in clinical practice should be conducted. Dr. Pinker gave a comprehensive overview of the potential role of AI for lesion characterization on ultrasonography and MRI. The available results are promising and showed that AI offers diagnostic advantages and potential help for multidisciplinary and therapeutic decision-making. Larger studies, though, are still warranted.

Thursday was the EYC Day! The committee, together with some EUSOBI experts and young radiologists, met for breakfast in a Zoom meeting to discuss breast cancer screening, image-guided treatment, AI, career advice, and tips and tricks for research in breast imaging.

In the evening, the EYC workshop and virtual party took place. The two 2021 EUSOBI Young Researcher Grant winners presented their project in a short pitch. Then the participants engaged in a lively discussion of the best types of follow-up after surgery and lymph node management, which also underlined the differences in management between countries. The session ended in a virtual party in which the participants became more acquainted.

Overall, it was a fascinating preview of what is coming this summer in Vienna.

References

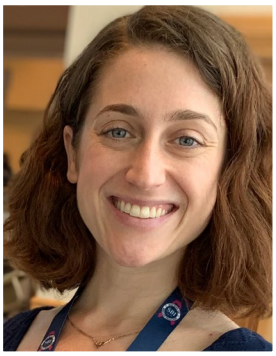
1. Pros and cons. Presented at: ECR Overture; March 2, 2022. Session TS 6.
2. Mann RM, Athanasiou A, Baltzer PAT, et al; European Society of Breast Imaging (EUSOBI). Breast cancer screening in women with extremely dense breasts recommendations of the European Society of Breast Imaging (EUSOBI). *Eur Radiol*. March 8, 2022. doi:10.1007/s00330-022-08617-6
3. Digital hybrid breast PET/MRI for enhanced diagnosis of breast cancer: achievements of the HYPMED Project. Presented at: ECR Overture; March 3, 2022. Session HYPMED.
4. Artificial intelligence (AI) in breast imaging. Presented at: ECR Overture; March 5, 2022. Session RC 1902.

MEMBER-IN-TRAINING COLUMN

Tips and Tricks for Trainees in Breast Interventions: Stereotactic-Guided Biopsy

By Amina Farooq, MD; Sophia O'Brien, MD

Amina Farooq, MD



Sophia O'Brian, MD

The multiple modalities available for image-guided core needle breast biopsy include stereotactic guidance, ultrasound guidance, and magnetic resonance imaging (MRI) guidance. It is best to use the modality that most ideally demonstrates the lesion. However, because of ease of technique, patient tolerance, and cost savings of ultrasonography, an attempt to identify an ultrasound correlate is recommended for all lesions initially noted on MRI or mammography except for calcifications.

This article is the first of a three-part Member-in-Training series in which we will provide an overview of breast biopsy image-guidance modalities along with trainee-specific tips and tricks. In this article, we discuss overall procedure considerations and stereotactic-guided breast biopsy. The subsequent articles will focus on ultrasound-guided and MRI-guided biopsies.

General Preprocedure Considerations

Consent is a critical component of all procedures. All risks and benefits of the procedure should be discussed with the patient before any intervention. Risks of breast biopsy include bleeding, infection, and pneumothorax. Relative contraindications for each modality include anticoagulation and, for MRI-guided procedures, metallic implants and claustrophobia.

General Postprocedure Considerations

- Specimen handling is an important skill. Gentle handling avoids disrupting and fragmenting the tissue.
- For stereotactic-guided biopsies of calcifications in particular, the tissue is often spread on a petri dish to obtain specimen radiographs to confirm appropriate target sampling.
- All tissue samples are submitted for pathological analysis in 10% formalin with correctly labeled specimen containers that should be verified by the radiologist before the procedure. Accurate specimen labeling is especially important if more than one site is biopsied.
- After the procedure, hemostasis can be achieved with 5 to 10 minutes of manual targeted compression followed by a postprocedure mammogram.
- The procedure report should always include the following:
  - The type of lesion and its location
  - The imaging method used for guidance
  - The biopsy device used
  - The number of tissue specimens obtained
  - Whether a tissue marker was placed
  - Results of the postbiopsy mammogram, including the relationship of the tissue marker to the index lesion
  - Whether any complications occurred during the procedure
- The procedure report is amended when the pathological analysis results are available, with either concordance or discordance noted and further management recommendations outlined.

Stereotactic-Guided Biopsy

Stereotactic-guided biopsies are performed for lesions best visualized on mammography, such as calcifications, asymmetries, and architectural distortions without a definite sonographic correlate. See the Figure for an example of a stereotactic biopsy case.

- Use the diagnostic mammography images to determine which projection optimizes visualization and shortens the distance to the lesion to plan your approach. When targeting a single-view asymmetry or subtle focal asymmetry, plan the biopsy approach according to the view that most clearly demonstrates the finding, which may not necessarily be the shortest distance.
- Always be mindful of your stroke margin, which is the distance between the needle tip and distal surface of the breast. This margin should be at least 4 mm.
- If the biopsy target appears superficial, a "petite" needle is a good alternative to a standard needle because it has a smaller biopsy trough.

- If more than one site is sampled in the same breast, markers of different shapes may be used at each site to facilitate distinction. Most markers are composed of titanium, which is MRI compatible and allows for subsequent image-guided preoperative localization in patients with a malignancy.
- When targeting a subtle asymmetry, be mindful of the amount of lidocaine instilled at the biopsy site to avoid masking the target finding.
- Don't forget about the "accordion" effect. When breast compression is released, the breast expands to its original shape and size and the clip can migrate in the direction of compression, ending up displaced from the actual biopsy site. To mitigate this effect, the first postbiopsy mammogram should be obtained in the same projection used for biopsy. Any clip displacement should be clearly described in the report. The migration measurements can be taken into account at the time of preoperative localization, if needed.
- When evaluating pathological analysis results, make sure the results include calcifications if they were targeted at the biopsy. Evaluate for radiology-pathology concordance to ensure that the biopsy results effectively explain the targeted lesion. For example, a result indicating benign breast tissue with microcysts would be discordant for a biopsied architectural distortion.
- Whenever malignancy is diagnosed, revisit the diagnostic imaging report to ensure there are no additional BI-RADS category 3 lesions that may require recommendations for additional biopsies. For example, if the same breast has 3 sites with similar calcifications and the biopsy result of one recommended site demonstrates ductal carcinoma in situ or atypia, it is important to recommend additional stereotactic biopsies to evaluate the extent of the disease process.

Conclusions

When preparing for procedures, trainees are encouraged to determine how they would approach the target and which device they would use before discussing the plan with their attending physician. Trainees should be involved in all aspects of the procedure appropriate to their level of training, including planning, performance, following up pathologic analysis, and even calling patients to discuss results.

Perhaps most importantly, trainees learning breast procedures should not be afraid to ask questions! Breast biopsies are tailored to the individual patient and lesion, with much nuance and finesse to be learned over the course of one's training and career.

For Further Reading

Mahoney MC, Newell MS. Breast intervention: how I do it. *Radiology*. 2013;268(1):12-24. doi:10.1148/radiol.13120985

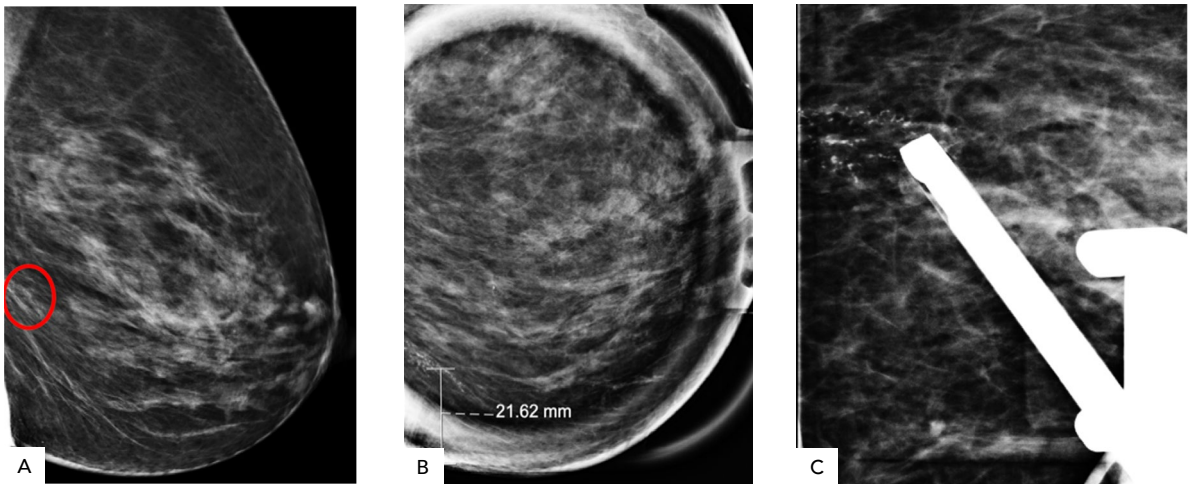


Figure. Stereotactic-guided biopsy of suspicious calcifications in a 76-year-old woman. (A) Left breast screening mammogram mediolateral oblique (MLO) view demonstrates new calcifications posteriorly. This image has a large amount of blur artifact limiting evaluation. (B) Left breast diagnostic mammogram mediolateral (ML) view with spot magnification reveals segmental fine, linear, branching calcifications in the lower outer left breast at posterior depth. Note how the calcifications appear lower on the ML view than on the MLO (medial findings on the MLO view will appear higher on the ML and lateral findings will appear lower; "muffins rise and lead sinks"). The calcifications were approximately 2.2 cm from the inferior aspect of the breast and 3.3 cm from the lateral aspect of the breast on the craniocaudal view (not shown). It was therefore decided to approach the biopsy from the inferior aspect of the breast. (C) Cropped image from stereotactic-guided biopsy performed from the inferior direction is shown. (D) Specimen image confirms calcifications within the sample. (E) Postbiopsy ML view shows the biopsy clip at the target site. Pathological analysis demonstrated ductal carcinoma in situ.

2022 SBI/ACR Breast Imaging Symposium Preview:

Interview With Keynote Speaker Gabriel Hortobagyi, MD, FACP

By Jessica W. T. Leung, MD, FACR, FSBI

Jessica W. T. Leung, MD, FACR, FSBI

Dr. Gabriel Hortobagyi is professor of medicine and Nellie B. Connally Chair in Breast Cancer in the Department of Breast Medical Oncology, Division of Cancer Medicine, at the University of Texas MD Anderson Cancer Center. He is also the program director of the Susan G. Komen Interdisciplinary Breast Fellowship at MD Anderson. In 2019, he was honored with the David A. Karnofsky Memorial Award from the American Society of Clinical Oncology (ASCO) for his lifetime work on breast cancer treatment. The ASCO announcement stated, "[Dr. Hortobagyi's] career, which spans more than 40 years, has focused on clinical and translational research, as well as teaching and mentoring the next generation of scientists and academic leadership. He is one of the world's leading authorities on the management of breast cancer."[1] Dr. Hortobagyi has authored more than 1000 scientific articles, pioneered the use of combination therapies, and championed the importance of multidisciplinary care for all breast cancer patients. Dr. Hortobagyi will deliver the keynote lecture, titled "Personalized Treatment of Breast Cancer," at the 2022 SBI/ACR Breast Imaging Symposium. The SBI is honored to host Dr. Hortobagyi at its annual meeting, and this article introduces Dr. Hortobagyi to SBI members.

JL: How did you decide to pursue a career in oncology, and how did you become a Texan?

GH: The early 1950s were tumultuous political times in my birth country of Hungary, so my family relocated to Bogotá, where I grew up learning Spanish and Latin dance. I trained in internal medicine in the early 1970s in Cleveland. At that time, medical oncology was still in its infancy, and chemotherapy was quite limited in its efficacy against adult solid tumors. Early in my training, I was part of a team that took care of a bedridden young woman with bone metastases from breast cancer…at that time, nothing could be done for her. I was moved and challenged by this case. Then there was an ASCO abstract talking about high responder rates to medical therapy, and I said to myself, I need to be a part of this.

I became hooked and came to MD Anderson for my fellowship. MD Anderson had about 600 to 800 employees when I came. It had a small family feel to it. Now, our institution is 22,000 strong. So against all odds, I became a Texan and raised my family here. And as they say, the rest is history.

I did have culture shock when I first arrived in Houston more than 4 decades ago, but I quickly learned to love my adopted hometown, which is great for music.

I hear that you are very musical! Tell me more about that. What kind of music?

I like all kinds of music: jazz, classical, big symphonic works. I used to sing in the Houston Symphony Choir: Britten's *War Requiem*, Beethoven's 9th [symphony], which is a huge choral piece. I also play the guitar, and I enjoy dancing.

Wow, can you teach me how to dance?

Yes—waltz, salsa, cha-cha.

What is your greatest source of joy?

Naturally, my amazing family. I have been married for over 4 decades. I have 3 daughters and 7 grandchildren. My eldest daughter is a rheumatologist.

How has your work in medical oncology changed over the years?

When I started out, there were 8, maybe 9, chemotherapy drugs. Now there are over 500 systemic agents for oncology, the names of some of which I can't even pronounce. Cancer patients have so much better outlook, but unfortunately, the insurance situation has gotten worse.

My academic work has also changed. I love writing [scientific] papers—I always have and I always will. That has not changed. [*Dr. Hortobagyi has published around 1400 scientific articles.*] But I recall the days of carrying around carousels of slides and bags and bags of x-rays, each 10 to 12 pounds…not any more these days!

Of your numerous career achievements, tell me about one of which you are particularly proud.

Bringing together my colleagues at MD Anderson to provide true interdisciplinary care. I remember working with Dr. Eleanor Montague—we would meet twice per week, treat patients with joint protocols, and run joint clinical trials. I believe that much of

our work here in Houston has set standards so that it is now widely accepted that interdisciplinary care is the best care for cancer patients. By working together, there are huge improvements in outcomes. [*Dr. Montague has been credited as a pioneer in the use of radiation therapy as part of breast conservation therapy.*]

What would you do differently in your career, if you were to do it over again?

Not much I'd change if I were to do it over again…maybe I would spend 1 more year in the lab, because there is so much to discover.

What advice (career, investment, or otherwise) can you give to breast radiologists?

Harness the power of molecular imaging, which is ideally designed to target certain drivers in signal transduction pathways. There is PET [positron emission tomography], which is still relatively early in development with so many more opportunities. Study specific probes for diagnosis and targeted treatment, whether these probes are used in MRI [magnetic resonance imaging] or other modalities.

What has been the most rewarding part of your career?

For patients to entrust me with their care.

What have been some important advances in breast medical oncology?

Discoveries of the hormone and HER2 [now ERBB2] receptors are undoubtedly major milestones, and we now have effective endocrine and HER2-targeted therapies. With the success of the Human Genome Project, we now have a plethora of targeted agents, which indelibly change how we practice, decreasing morbidity and increasing survival and even curing a percentage of oligometastasis cases. The number of antibody-drug conjugates has mushroomed. And then there is the advent of immunotherapy.

All that is super exciting. Anything else you see in the future for breast medical oncology?

So much! We understand biology so much better now, and this allows us to develop targeted therapies and advanced technology. There is so much more to be done. There are great opportunities to grow in this field!

Come hear the rest of the story in Dr. Hortobagyi's keynote lecture, which will take place at 8:00 AM on Tuesday, May 17, 2022, in Savannah, Georgia.

Reference

1. ASCO honors leaders in cancer care with 2019 special awards. News release. American Society of Clinical Oncology; March 13, 2019. Accessed April 14, 2022. https://www.asco.org/about-asco/press-center/news-releases/asco-honors-leaders-cancer-care-2019-special-awards

Gabriel Hortobagyi, MD, FACP

IDEA Committee Updates

By Tejas S Mehta, MD, MPH, FSBI; Tatianie Jackson, MD

Our ability to reach unity in diversity will be the beauty and the test of our civilisation.

- Mahatma Gandhi[1]

Tejas S. Mehta, MD, MPH, FSBI

Tatianie Jackson, MD

With societal and cultural changes, organizations globally have expressed a renewed commitment to diversity, equity, and inclusion (DEI). In April 2020, the Inclusion Diversity Equity Alliance (IDEA) was formally added to the SBI's committee framework. The alliance convened with the purposes of (1) identifying the inclusion and diversity strengths, issues, and opportunities within all aspects of the SBI; (2) developing strategies and plans to examine how we include and exclude (however unintentionally) SBI members; and (3) systematically examining aspects of the SBI to help it meet the needs of a growing, diverse membership.

Despite the induction of IDEA coinciding with the peak of the COVID-19 pandemic, with requirements of isolation, social distancing, and shutdowns of nonurgent services, the alliance was able to successfully assemble, albeit virtually. This time period posed challenges for many reasons other than the pandemic, which led to our first call to action: a formal statement on the racial injustices affecting our colleagues, patients, and communities at large.[2]

To better understand the SBI membership, we surveyed members in November 2020. Questions covered demographics, observations of DEI in the SBI, the annual symposium, and SBI resources. Open-ended questions sought ideas to better serve and engage members. Through the data collected, we were able to identify opportunities to expand and diversify membership, gain awareness of resources most helpful for SBI members, and obtain baseline data on opinions regarding the society. (This survey was independent of the more recent in-depth survey and focus groups conducted by Nika White Consulting, the consulting firm SBI has partnered with to develop a DEI strategic plan to support the overall strategic plan.)

In response to an identified need for additional virtual educational resources, IDEA has hosted and cohosted a series of webinars:

- In collaboration with the SBI Communications and Advocacy Task Force and the Social Media Committee, we cohosted a webinar titled "Health Equity in Breast Imaging" in October 2020.
- In collaboration with the Massachusetts chapter of the ACR, we arranged a panel discussion, "Breast Imaging Reentry After COVID-19."
- For Pride Month 2021, we held a webinar titled "Breast Imaging and the LGBTQ+ Community."
- We continued the themed approach for Latinx Heritage Month, September 2021, when we hosted "Culturally Competent Care for Hispanic/Latino Patients."
- Most recently, in February 2022, in recognition of Black History Month, we hosted another live webinar titled "Culturally Competent and Individualized Breast Care for the African-American Patient."[3]

To diversify our future workforce, we need to expand the pipeline, specifically focusing on increasing awareness of medicine and radiology (and breast imaging) as a profession for underrepresented minority students. Many of the IDEA members, like many of you, have worked with their local communities on this initiative. Later this year we hope to hold our inaugural virtual mentor outreach event for a Boston public school. Our vision is that the alliance will create a template and support structure available to any member who would like to lead this type of event in their community, with opportunities for attendees to hear from others around the country and even globally as our international presence expands.

Later this year, an IDEA web page will be added to the resources on the SBI website. It will showcase our diverse membership and include resources related to DEI initiatives and topics for patients, referrers, and breast radiologists. We also aspire to create and/or translate some resources into different languages.

DEI is intertwined in all aspects of the SBI, including the numerous other SBI committees. The success of IDEA is only possible with continued engagement from SBI leaders, committees, and the overall membership. This is a pivotal time, and we are excited to work with you as we strive to reach our united goals in support of the SBI strategic plan.

We welcome your thoughts and ideas. For more information about IDEA or to discuss opportunities for collaboration, please reach out to Dr. Mehta at tejasmehtamd@gmail.com or Dr. Jackson at tjtjackso2@gmail.com.

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TECHNOLOGISTS' COLUMN

The Medical Outcomes Audit: A Team Approach to Understanding the Data and Sharing Results

By Sarah Jacobs, BS, RT(R)(M)(CT); Robyn Hadley, RT(R)(M)

Sarah Jacobs, BS, RT(R)(M)(CT)

Robyn Hadley, RT(R)(M)

One of the most valuable tools in a successful mammography program is the medical outcomes audit (MOA). Unfortunately, many facilities and individuals rarely give enough credit to this report, not realizing it provides much more than the calculated statistics. The MOA, when fully understood and analyzed, provides motivation for success and solidarity among breast imaging teams.

The MOA is often initiated by lead technologists in the first quarter of each year. This audit can remain a daunting item on the list of tasks to be completed before the annual Mammography Quality Standards Act (MQSA) inspection. Many mammography tracking systems automatically track the outcomes audit data, but additional steps are required to effectively interpret and understand the data. An individual who is ready to complete this task may log in to the mammography tracking software system (if available), select the appropriate dates and parameters, print the report, and then provide it to the lead interpreting physician for review and signature. After the report is reviewed by the lead interpreting physician and other interpreting physicians, it is filed to demonstrate compliance upon MQSA inspection. "Little is known about how radiologists use and interpret the performance feedback" from this report, wrote Fenton et al.[1] Often, only the interpreting physicians and lead technologist see these data, and their reviewing process may take only a few seconds. Does this sound familiar? Do the numbers on the report really matter? Why are the data so important and what significance do they have for your entire team? In this article, we explain the MOA and why breast imaging radiologists and technologists should review these important reports.

What Is the Mammography Audit and Why Is It Valuable?

Although the MOA may be one of the most misunderstood and underutilized tools within an imaging team, it is a valuable method for evaluating the performance of a mammography program and the accuracy of mammographic interpretation. It is the only certain assessment of clinical outcomes in mammography, and it measures both technical and interpretive aspects of mammography performance. The MOA is a requirement of the MQSA and can be used in medicolegal defense. These are some of the countless benefits of tracking and understanding the data:

- Measuring a mammographer's success in finding small, curable cancers
- Assessing a technologist's positioning skills and identifying opportunities for improvement
- Identifying false negatives and determining the cause so corrections can be implemented, preventing future shortcomings
- Ensuring all patients are followed through from their initial screening to final diagnosis
- Assessing referring clinician and patient compliance
- Improving referring clinician and patient compliance, if the data show good performance and are shared with others

Valuable Metrics: Why to Measure and What They Mean

Raw data must be collected and derived data must then be calculated for reporting metrics (Figure 1). Benchmark values for screening and diagnostic studies are different, so screening and diagnostic information must be collected and calculated separately. In addition, the cancer detection rate is much higher in patients presenting with symptoms than in those recalled from a screening examination for diagnostic evaluation.[2]

The following six metrics are important in creating a meaningful audit:

- Positive predictive value (PPV)
  - PPV1: percentage of screening examinations with abnormal findings that resulted in a diagnosis of cancer. This is a measure of perceptual skill and how well an individual perceives a cancer.
  - PPV2: percentage of cases recommended for biopsy because of a screening examination that resulted in a diagnosis of cancer. This is a measure of analytical skill, or how well an image was analyzed and a decision made to recommend biopsy or not.
  - PPV3: percentage of all biopsies actually performed because of a screening examination that resulted in a diagnosis of cancer. This is also referred to as the positive biopsy rate.

Continued on page 12>

- Sensitivity
  - Probability of detecting a cancer when a cancer exists
  - Percentage of all patients found to have cancer within 1 year of a screening examination who were correctly diagnosed as having breast cancer at the time of screening
  - Accurate data for sensitivity are difficult to obtain because of the challenges of acquiring false-negative data. However, facilities that have access to a tumor registry or are part of a closed system can effectively accomplish this.
  - To some extent, measuring approximate sensitivity values on the basis of known false-negative cases can be useful.
- False negative
  - Diagnosis of breast cancer within 1 year of a screening mammography examination with normal findings
  - Should be measured and analyzed independently regardless of whether sensitivity can be accurately measured
  - An extremely important metric to measure and analyze for learning purposes and implementing practice improvements
  - Should be shared anonymously to establish a trustworthy environment that allows for effective evaluation and learning opportunities
- Specificity
  - Probability of normal mammography findings when no cancer exists
  - Percentage of all patients found not to have breast cancer within 1 year of a screening examination with normal findings
- Cancer detection rate
  - Screening cancer detection rate is the number of cancers found per 1000 patients screened.
  - Prevalent cancers are those found at first screening. Incident cancers are those found at subsequent screenings. It is useful to separate prevalent and incident cancers, if possible, so data can be calculated separately for truly accurate reporting.
  - Diagnostic cancer detection rate is the number of cancers found per 1000 patients presenting for diagnostic evaluation because of symptoms. Diagnostic cancer detection rates are typically much higher than screening cancer detection rates because patients present with symptoms.
- Recall rate
  - Percentage of patients undergoing screening examinations who are recommended for further imaging evaluation
  - It is important to know if a practice is detecting cancers within a reasonable number of recalls from screening.

Calculating and Interpreting the Data: Who Is Responsible?

The MOA data are sensitive and must be collected, calculated, and reported correctly. This requires team effort and designation of responsible individuals. The MQSA requires that facilities select an audit interpreting radiologist to review the report and share the information with other interpreting radiologists. The audit interpreting radiologist should select a lead individual or individuals to compile and analyze the data. Typically, this individual is a lead technologist or manager. It is imperative that this individual be trustworthy and well educated on each component within the audit. The lead individual must also have a solid understanding of the desirable outcomes. The data must be collected and analyzed in a consistent manner by all staff members. All locations and staff members within an organization should record and calculate data in the same manner, whether through an electronic reporting system or manually. Staff education sessions that target proper data collection and entry are beneficial in ensuring consistent and accurate results.

Sharing the Results: Who Benefits?

The MOA can be one of the most valuable assets to boost morale and drive motivation in a positive direction for the entire breast imaging team when information is shared in an effective manner. Once the data have been collected, calculated, and analyzed, it is crucial to share the statistical data with key individuals within a breast imaging team. Key team members include all interpreting radiologists, all staff technologists, leadership and administrative personnel, and referring clinicians. There are many benefits to sharing the data with key individuals.

Radiologists

The audit data are a reflection of the accuracy of mammographic interpretation. All interpreting radiologists should review the data and compare them to facility statistics and national benchmarks. Interpreting radiologists should receive a report of their individual statistics and be given the opportunity to review the report independently and privately. Image review of known false-negative cases is important to evaluate and assess for learning opportunities.

Technologists

The audit data are a reflection of the technologists' positioning skills. A facility that reports an optimal cancer detection rate, with a high percentage of detected cancers being small, is a direct reflection of the technologists' excellent work. This result is a team effort that begins with the technologists' images. False-negative case review is an opportune time to evaluate not only a radiologist's interpretive skills but also a technologist's positioning skills to assess whether poor positioning contributed to the false-negative case.

Administrators

Reporting valuable metrics provides administrators with solid evidence of how well the imaging team is performing. Most importantly, metrics include patient outcomes.

Finding a way to effectively share these data can be extremely

beneficial. Presenting the information to the entire team in an anonymous format with image review of false-negative cases can be effective for reporting results and engaging team members. Using visual aids such as graphs and charts can help provide additional understanding. Benchmarks should be clearly stated and displayed on graphs to ensure individuals have a clear understanding of the team's goals. It is helpful to present data with comparison to peers, comparison with published national benchmarks, and comparison over time (Figures 2 and 3).[3] The Breast Cancer Surveillance Consortium (https://www.bcsc-research.org) can be used to access updated national performance benchmarks.

Although the MOA may be tedious, it has the ability to strengthen and unify a breast imaging program when data are calculated, analyzed, and shared appropriately. During a time of high stress and anxiety in our working environment, focusing on the positive learning aspects of the MOA is imperative.

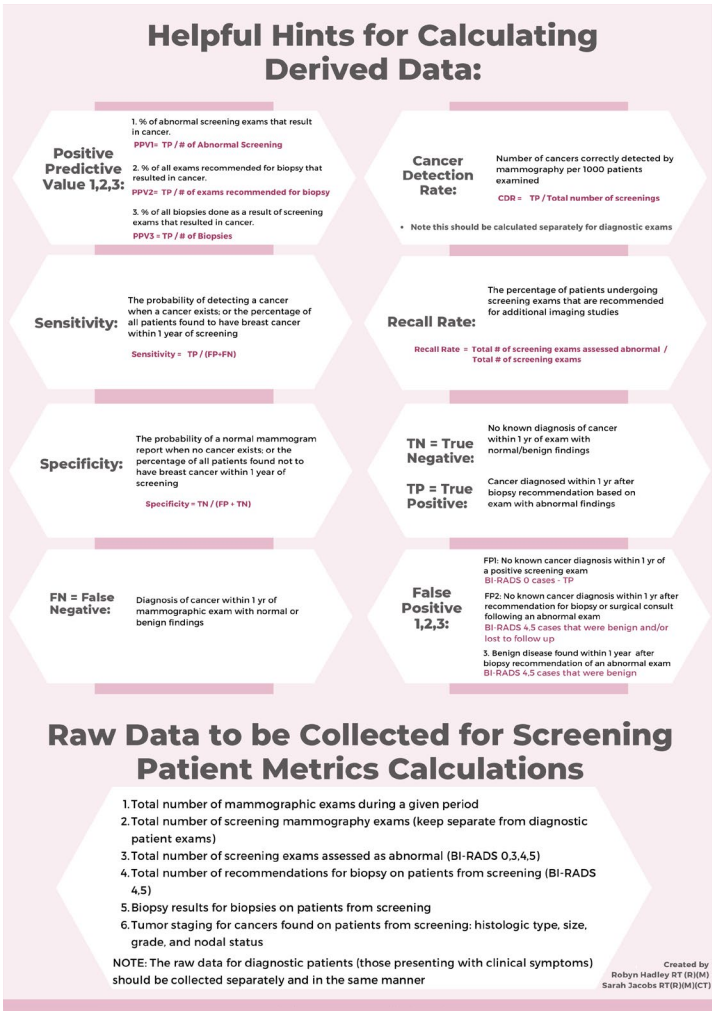

Figure 1. Data calculations from medical outcomes audit. Created by Robyn Hadley, RT(R)(M), and Sarah Jacobs, RT(R)(M)(CT).

Acknowledgements

We would like to pay a very special thank you to Dr. Michael Linver for his contributions to this article. His generosity in sharing his knowledge and expertise, along with unwavering efforts in helping breast imagers gain perspective and understanding, is greatly appreciated.

References

1. Fenton JJ, Egger J, Carney PA, et al. Reality check: perceived versus actual performance of community mammographers. *AJR Am J Roentgenol*. 2006;187(1):42-46. doi:10.2214/AJR.05.0455
2. Linver MN, Osuch JR, Brenner RJ, Smith RA. The mammography audit: a primer for the mammography quality standards act (MQSA). *AJR Am J Roentgenol*. 1995;165(1):19-25. doi:10.2214/ajr.165.1.7785586
3. Aiello Bowles EJ, Geller BM. Best ways to provide feedback to radiologists on mammography performance. *AJR Am J Roentgenol*. 2009;193(1):157-164. doi:10.2214/AJR.08.2051

BCSC Benchmark	4.7				
GOAL	>2.5				
Cancer Detection Rate					
	2017	2018	2019	2020	2021
Radiologist A, MD	8.0	10.4	7.2	9.0	6.4
Facility	4.8	5.0	5.8	7.5	6.8
BCSC Benchmark	4.7	4.7	4.7	4.7	4.7

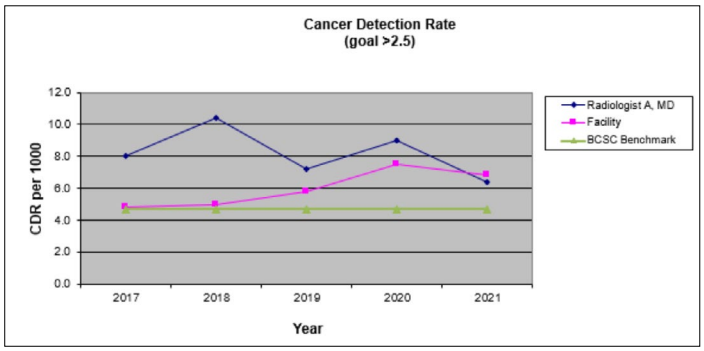

Figure 2. Example of a cancer detection rate data presentation from a medical outcomes audit.

BCSC Benchmark	25.4%				
GOAL	20%-40%				
PPV 2					
	2017	2018	2019	2020	2021
Radiologist A	38.0%	55.0%	32.0%	35.0%	27.0%
Radiologist B	35.0%	29.0%	36.0%	39.0%	27.0%
Radiologist C	27.0%	26.0%	27.0%	55.0%	33.0%
Radiologist D	32.0%	27.0%	36.0%	29.0%	35.0%
Radiologist D	26.0%	39.0%	25.0%	38.0%	36.0%
FACILITY	33.0%	37.0%	28.0%	30.0%	32.0%
BENCHMARK GOAL	25.4%	25.4%	25.4%	25.4%	25.4%

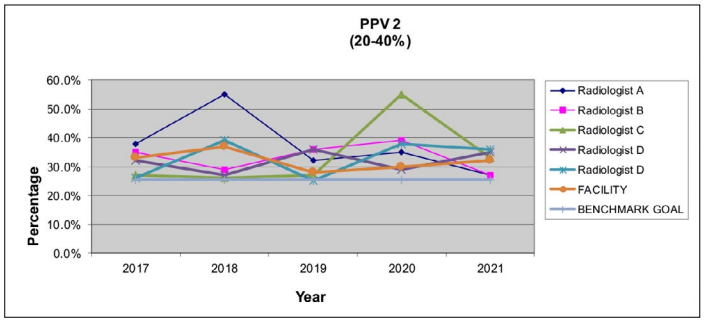

Figure 3. Example of a positive predictive value 2 data presentation from a medical outcomes audit.

CANADIAN CORNER

Canadian Society of Breast Imaging Updates

By Jean Seely, MD, FRCPC, FSBI, FCAR

Jean Seely, MD, FRCPC, FSBI, FCAR

I am delighted to welcome spring. It has been a long winter! Hope is in the air. It's great to be positive about upcoming events.

There are many exciting advances from the Canadian Society of Breast Imaging (CSBI) to let you know about. Work on the Canadian National Breast Screening Studies (CNBSS) was recently published in the *Journal of Breast Imaging*. Thanks to the courageous efforts of 29 Canadian radiologists, technologists, and research staff members who shared their accounts of work on the 30-year-old CNBSS, we published an original research study[1] summarizing these first-hand accounts. We also recently published a scientific review[2] that summarized the major flaws of these trials. These two articles, along with an editorial by Dr. Stephen Duffy,[3] call for policy makers to review the evidence and change recommendations for breast cancer screening for women aged 40 to 49 years, which have been heavily based on the CNBSS trials.

In several parts of Canada, breast cancer screening for women 40 to 49 years old has major barriers, including the need to obtain a physician requisition for a screening mammogram. Family physicians, following the national Canadian Task Force guidelines that recommend against screening women aged 40 to 49 years, often refuse their patients' requests to obtain a screening examination. Additionally, women who do not have a health care provider, who lack awareness about the benefit of early breast cancer detection, or who fear cancer are often not screened. The COVID-19 pandemic has potentially exacerbated barriers to care. CSBI members are observing greater numbers of advanced breast cancers, particularly in historically underserved Black, Asian, and Indigenous women, whose peak breast cancer incidence occurs in their 40s.

Several radiology associations, including the Ontario Association of Radiologists (OAR), have collaborated with CSBI to educate their members about the importance of screening women for breast cancer starting at age 40 years. The OAR, a professional society of 1000 radiologists, is calling on the provincial government to include women aged 40 to 49 years in its publicly funded screening program. In Canada, unlike other countries, very few options to seek private health care for breast cancer screening are available without leaving the country.

Educational events are instrumental to raise awareness of this issue. On January 13, 2022, the OAR hosted a webinar for its members. Seven hundred fifty registrants heard Drs. Paula Gordon, FSBI, Dan Kopans, FSBI, Martin Yaffe, FSBI, Shushiela Appavoo, and Jean Seely, FSBI, share information about the CNBSS and reasons why women in their 40s should be screened with regular mammograms. On March 13, 2022, in collaboration with Canadian Radiology Women, CSBI hosted a webinar for radiologists and physicians. The recorded event is available on the CSBI website. On March 22, 2022, the OAR hosted a webinar for referring family physicians and health care providers to offer education and advocacy regarding this topic.

The CSBI's active Patient Engagement Working Group is amplifying these efforts and enlisting widespread patient support to spur increased advocacy. With the group's 10 active patient members, each with experience and many talents, I am confident that our efforts to change the guidelines in Canada will be achieved. Thanks to our patient advocates, we are changing the landscape.

The CSBI Magnetic Resonance Imaging (MRI) Working Group produced their report on February 23, 2022. A letter published in the *Canadian Association of Radiologists Journal*[4] summarizes the key points: (1) availability of MRI machines and access to breast MRI are limited, and a minority of breast MRI examinations are dedicated to screening; (2) the average time to perform breast MRI is 40 minutes; and (3) radiologists in most centers are interested in learning about Canadian Association of Radiologists–compliant shortened protocols to improve access. Greater use of these protocols and more training would support the working group's recommendation to provide greater access to supplemental screening to women with dense breast tissue and to women at high risk who are not currently served with MRI because of the very limited availability. The full report can be found on the CSBI website: https://csbi.ca/wp-content/uploads/2022/02/Canadian-Society-of-Breast-Imaging-BMRI-Working-Group-Report.pdf.

On March 30, 2022, CSBI hosted a breast imaging career night for trainees, including medical students and radiology residents. Panelists spoke about breast imaging from the perspectives of a fellowship, academic radiology, and community radiology. Panelists included Drs. Andrew Chan, Fred Matzinger, Jenny Jessup, and Lisa Smyth. This exciting opportunity was designed to share information about breast

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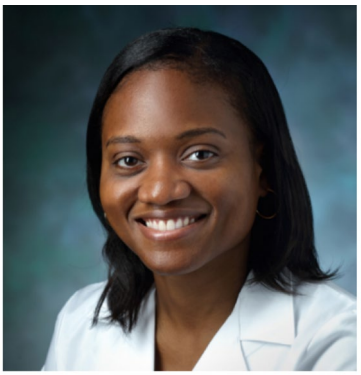
YPS YOUNG PHYSICIAN SECTION

Tips on Starting a Breast Imaging Research Career

By Emily Ambinder, MD, MS; Naziya Samreen, MD

SBI Young Physician Section (YPS) Committee members Dr. Emily Ambinder and Dr. Naziya Samreen reached out to four YPS members with successful research careers to learn about their experiences as researchers and to highlight some of their work. We were struck by common themes that these researchers discussed, especially the importance of mentorship and having passion for your work. These are highlights from their responses. Meet our four researchers:



Eniola Oluyemi, MD, MPH, Associate Professor, Breast Imaging Division, Johns Hopkins University School of Medicine

Manisha Bahl, MD, MPH, FSBI, Associate Professor of Radiology, Harvard Medical School

Anand Narayan, MD, PhD, Vice Chair of Equity, Associate Professor, Department of Radiology, University of Wisconsin-Madison

Laura Heacock, MD, Clinical Assistant Professor, NYU Langone Health

What made you interested in breast imaging research?

Having good mentors seems to be the most significant factor. Dr. Bahl said, "I was fortunate to connect with Dr. Jay Baker and Dr. Sujata Ghate when I was a trainee at Duke University. [They] encouraged me to pursue research and offered ideas for potential projects." Dr. Oluyemi similarly said, "I was fortunate to have the opportunity to work with great researchers who inspired me and allowed me to see the potential that research has to truly transform the field of breast imaging and to improve the care that we provide to our patients." Intellectual stimulation and desire to contribute to the field have also been major factors among the panelists. Dr. Heacock said, "I was inspired by the researchers in the NYU breast imaging section who had worked on everything from breast MRI sequence development to machine learning to population-based studies. There have been astonishing advances in breast imaging due to breast imagers around the world, and I have always been excited to be able to contribute to this body of knowledge." Dr. Narayan said, "Research is a way for us to think about new ways we can provide better care for our patients and figure out which of those ways can actually deliver real benefits for our patients."

What are challenges that you have had in breast imaging research?

Regarding grants, Dr. Heacock said, "The serious academic breast imager will want and need grants to continue to fund his or her work. For this, you should actively seek out mentors at your home institution and in national committees. Grant writing is a specialized type of writing and as you start out you will want advisors who can offer detailed critiques." Dr. Heacock reminds us, "You will be rejected often in the first few years, and that's normal. Seek out as much constructive criticism as you can from anyone who reviews grants for the NIH [National Institutes of Health].... Perseverance is key!" Dr. Bahl said, "I have been fortunate to receive grant funding from the NIH, RSNA [Radiological Society of North America], and MGH [Massachusetts General Hospital] and to work at an institution that is highly supportive of physician-investigators. Grant funding, which has provided me with academic time and resources, has been critical to the success of my research career." Additional resources and planning for research were also discussed. Dr. Narayan said, "Access to high-quality data represents a major challenge, particularly for specific research questions. Institutional databases are often our go-to source for

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clinical research, but these sources can be limited in terms of geographic and racial/ethnic diversity. The development of larger-scale electronic medical records systems and cross-institutional collaborations have helped to reduce some of these burdens." Dr. Oluyemi said, "A challenge for me when I first started out as a breast imaging attending [physician] was figuring out how to balance my research and clinical responsibilities, but this became less difficult once I got grant funding. Obtaining grant funding was challenging but I have learned that it helps to be persistent." Both Dr. Bahl and Dr. Oluyemi also discussed the issue of authorship. "Authorship can be challenging to discuss, especially as a junior faculty member or trainee; however, over time, I have learned how important it is to discuss authorship when planning research and to decide authorship before even starting research projects," Dr. Bahl said. Dr. Oluyemi echoed Dr. Bahl's comments on authorship, saying, "I have found that it helps to define the first author and last author at the start of the project so as to set clear expectations and minimize the likelihood of authorship disputes."

Do you have advice for other junior faculty members who are trying to get started with a research career?

Dr. Narayan stated, "First, I'd say take a look around you and see what are the major challenges that you and your colleagues are grappling with. Dig deep into these and use data collection and high-quality research methods to understand and come up with solutions to these challenges. By centering your efforts on these problems, you will be much more likely to engage in high-impact research projects that impact the lives of your patients." Dr. Bahl named three important areas: "Identify good mentors: find mentors who are productive researchers and have a track record of success in mentoring junior faculty and trainees. Persevere: be steadfast in the pursuit of your goals, try not to take rejections and setbacks personally, and put yourself out there as much as possible. Start early: the amount of time it takes to develop a successful research grant proposal can easily be underestimated, and the likelihood of success is increased by working closely with mentors and team members to critically review the proposal before submission." Dr. Heacock also emphasized the role of mentorship, specifically telling residents and fellows, "Now is the time to find the mentors you need to be successful in it. If you believe you are headed for a dedicated research track, be upfront with your section head and your department chair about your plans. If you want to be sponsored for specific grants or would like a specific amount of academic time, you won't be able to get it without their buy-in." Dr. Oluyemi has found that collaboration is key to success, advising junior faculty members to "collaborate with others when possible. Working together with colleagues can make doing research more enjoyable and provides an opportunity to brainstorm ideas."

Do you have a mentor, and if so how did you connect with your mentor? Any advice for young physicians looking for mentors or networking opportunities?

Dr. Bahl said, "Yes, I have been fortunate to have mentors who have supported, encouraged, and inspired me. I have connected with mentors through research projects, professional conferences, and other academic activities (eg, serving on an editorial board). I believe that having mentors with different backgrounds and strengths can help achieve a more balanced perspective." Dr. Oluyemi echoed Dr. Bahl's response, saying that she has "a team of mentors" and that she is "grateful for all of my mentors and the impact that they have had on my career." She advised young physicians, "Keep an open mind and try not to rule out anyone as a potential mentor because sometimes the people who turn out to be the best mentors for us are the ones that do not check the boxes that we were initially looking for in a mentor." Dr. Heacock "can't overemphasize the importance of mentorship to the junior researcher. A good mentor can answer your questions and guide your journey. They know what pitfalls to avoid and have a wealth of experience to offer you." Dr. Narayan added that he is "lucky to rely on several people from various phases of my life (medical school, graduate school, residency, fellowship, academic medical centers) whom I can rely on as mentors." He recommends connecting with "mentors who have a track record of elevating and supporting junior faculty members."

Tell us briefly about a research project that you've worked on that you're most excited about.

Dr. Heacock is "tremendously excited about the potential of machine learning/AI [artificial intelligence] in breast imaging" and is working with "the AI team at NYU Langone Health" on an ultrasound AI project.[1] Dr. Bahl is also leading AI research, working with her collaborators at MGH and Massachusetts Institute of Technology to "develop and implement an AI algorithm that accurately risk stratifies women with ductal carcinoma in situ (DCIS)."[2] Dr. Narayan was excited to describe the rapid clinical implementation of an initiative with Dr. Gary Wang and Dr. Connie Lehman to improve access to screening mammography by providing "patients with 'Pink Cards' to enable them to obtain walk-in screening mammograms followed by rigorous epidemiological evaluation of the program."[3] Dr. Oluyemi answered, "I am very excited about the disparities-focused research projects that my team and I have worked on over the past few years because health disparities is my main focus of research interest and I believe in the great impact that these projects can have on improving public health." She also highlighted a recently published manuscript addressing the issue of COVID-19 vaccine-associated adenopathy.[4]

Do you have any other advice?

Dr. Heacock had a few words of enthusiasm about how to get started: "Everyone has to start somewhere! If you have an affiliated university, PhDs and postdocs are often eager to work with someone who has clinical experience. Don't hesitate to email people in your department who are working on similar projects. Local, national, and international meetings (state associations, SBI, RSNA, AUR [Association of University Radiologists], ISMRM [International Society for Magnetic Resonance in Medicine]) are a great way to meet collaborators at other institutions. You may work in a facility where research time must be 'earned' or 'bought' based on metrics. Scale your projects to your time. Literature reviews, quality projects, or surveys can be done a little bit at a time at the beginning or end of the day. Always try to get the abstracts out as soon as possible and start writing up the paper as soon as the abstract is submitted." In the spirit of mentoring, Dr. Heacock (lheacock@gmail.com) and Dr. Bahl (MBAHL1@mgh.harvard.edu) have also offered YPS members the opportunity to contact them with any questions.

Check out their work mentioned in this article:

1. Shen Y, Shamout FE, Oliver JR, et al. Artificial intelligence system reduces false-positive findings in the interpretation of breast ultrasound exams. *Nat Commun*. 2021;12(1):5645. doi:10.1038/s41467-021-26023-2
2. Oseni TO, Smith BL, Lehman CD, Vijapura CA, Pinnamaneni N, Bahl M. Do eligibility criteria for ductal carcinoma in situ (DCIS) active surveillance trials identify patients at low risk for upgrade to invasive carcinoma? *Ann Surg Oncol*. 2020;27(11):4459-4465. doi:10.1245/s10434-020-08576-6
3. Wang GX, Pizzi BT, Miles RC, et al. Implementation and utilization of a "pink card" walk-in screening mammography program integrated with physician visits. *J Am Coll Radiol*. 2020;17(12):1602-1608. doi:10.1016/j.jacr.2020.07.007
4. Nguyen DL, Ambinder EB, Myers KS, Mullen LA, Panigrahi B, Oluyemi E. COVID-19 vaccine-related axillary adenopathy on breast imaging: follow-up recommendations and histopathologic findings. *AJR Am J Roentgenol*. Published online December 22, 2021. doi:10.2214/AJR.21.27162

IDEA Committee Updates (continued from page 10)

References

1. Gandhi MK. Kathiawad conference address. *Young India*. January 8, 1925.
2. Society of Breast Imaging Inclusion Diversity Equity Alliance position statement on racial justice. Society of Breast Imaging. June 2, 2020. Accessed March 23, 2022. https://www.sbi-online.org/Portals/0/Position%20Statements/2020/SBI-IDEA-position-statement-on-racial-justice_June-2-2020.pdf
3. Society of Breast Imaging. Culturally competent and individualized breast care for the African-American patient. YouTube. February 23, 2022. Accessed March 23, 2022. https://www.youtube.com/watch?v=m2d6pdZEzew

Canadian Corner: Canadian Society of Breast Imaging Updates (continued from page 14)

imaging fellowships and career options with our trainees in Canada. This type of opportunity was identified as a need in a CSBI survey.[5] The future of our specialty lies in attracting motivated, keen, and bright people. This is the way to ensure our success.

The fifth CSBI annual conference will be held virtually on May 28, 2022. The theme of the 2022 Annual Scientific Meeting is "Multidisciplinary Updates in Breast Imaging." I look forward to seeing many of you there. As we continue to work through the many backlogs induced by the pandemic, we must stay balanced and maintain connections. Let's hope that connections can be maintained virtually or in person at the upcoming SBI and CSBI meetings. In the meantime, welcome to spring!

References

1. Seely JM, Eby PR, Gordon PB, Appavoo S, Yaffe MJ. Errors in conduct of the CNBSS trials of breast cancer screening observed by research personnel. *J Breast Imaging*. Published online March 29, 2022. doi:0.1093/jbi/wbac009
2. Seely JM, Eby PR, Yaffe MJ. The fundamental flaws of the CNBSS trials: a scientific review. *J Breast Imaging*. Published online March 29, 2022. doi:10.1093/jbi/wbab099
3. Duffy SW. Problems with the Canadian National Breast Screening Studies. *J Breast Imaging*. Published online March 29, 2022. doi:10.1093/jbi/wbac004
4. Khoury ME, Yong-Hing CJ, Scaranelo AM, et al; CSBI Breast MRI Working Group and the CSBI Board of Directors. The Canadian Society of Breast Imaging Breast Magnetic Resonance Imaging Working Group report. *Can Assoc Radiol J*. 2022:8465371221084047. doi:10.1177/08465371221084047
5. Wu T, Law W, Islam N, Yong-Hing CJ, Kulkarni S, Seely J. Factors influencing trainees' interest in breast imaging. *Can Assoc Radiol J*. 2021:8465371211049553. doi:10.1177/08465371211049553

PHYSICS & TECHNOLOGY COLUMN

Total-Breast PET: Developing an Unconventional MRI-Compatible PET System to Monitor Breast Health

By Martin P. Tornai, PhD

Martin P. Tornai, PhD

Our consortium collaboration has devised a nonstandard-geometry dedicated breast positron emission tomography (PET) imaging system with the objective of maximizing system sensitivity.[1,2] Our paradigm-shifting total-breast PET imaging approach addresses many limitations that have prevented dedicated breast PET imaging from having a larger clinical impact in breast cancer assessment.

Molecular breast imaging (MBI) has been under development for almost three decades and encompasses metabolic imaging of disease by using injectable single-photon-emitting or positron-emitting radiolabeled tracers. In 1997, the Food and Drug Administration (FDA) approved the use of technetium Tc 99m sestamibi for scintimammography, which used a conventional gamma camera to image the breasts.[3] Tc 99m sestamibi showed a high affinity for breast tumors, which enabled functional imaging because it is metabolized by the high concentration of mitochondria in active tumor cells and is therefore not affected by anatomic characteristics such as breast density or surgical distortion. Although scintimammography with conventional gamma cameras showed good sensitivity and specificity for larger tumors, its low sensitivity for tumors smaller than 15 mm did not meet prevailing standards for breast imaging.[4,5] Subsequent improvements in gamma camera technology and optimized image acquisition parameters allowed for higher sensitivity for detecting subcentimeter lesions and ushered in the upgraded technology now referred to as MBI. With the name depending on the type of camera used and sestamibi dose, breast-specific gamma imaging and MBI systems were developed in research laboratories. A few companies successfully commercialized these systems (with FDA clearance) for single-photon imaging. Concurrent with development of MBI was the development of dedicated breast PET, specifically positron emission mammography (PEM). Breast PET or PEM was FDA approved in 2003 to help with presurgical planning and staging, evaluate axillary lymph nodes, monitor response to neoadjuvant chemotherapy, and evaluate for recurrent disease.[6] While there are physical as well as radiochemical differences between the two approaches, both are fundamentally metabolic or molecular imaging systems that use small tracer amounts of the injected radiopharmaceuticals routinely used in nuclear medicine. Several smaller-scale clinical trials showed the capabilities of MBI,[7] such as high sensitivity to detect high-risk lesions (95%), invasive breast cancer (98%), and ductal carcinoma in situ (91%). Another use is the surveillance of women at high risk and especially women with dense breasts. Additionally, a lexicon similar to BI-RADS was developed for MBI, as with magnetic resonance imaging (MRI) and ultrasonography.[8] The MBI procedures are reimbursed in the United States, and approximately 250 dedicated single-photon and positron imaging systems are installed worldwide.

In this nascent era of personalized medicine, along with the early successes of imaging-based cancer treatment using considerably higher amounts of radiolabeled molecules (ie, for nuclear medicine–based "theranostics"), researchers are exploring newly available and robust technologies for reimagining dedicated breast imaging and its role in disease diagnosis, characterization, and therapeutic monitoring. With more than 20 years of technological advances in MBI,[9] our team contemplated how to address the many needs voiced by breast radiologists, technologists, and patients for decades. We specifically sought to address the following concerns:

- Imaging the anterior chest wall, or at least easily imaging the entire area posterior to the breast tissue
- Imaging the axilla, ideally without repositioning the patient or imaging device
- Imaging both breasts simultaneously, allowing for immediate contralateral comparisons and/or single-injection tracer or contrast measurements
- Obtaining both anatomic and metabolic information in a single study
- Maintaining the possibility for biopsy access
- Faster imaging, allowing for reduced patient imaging times and discomfort, and as-needed dynamic scanning
- Imaging gently, with minimal to no breast compression or other discomfort to the patient
- Using minimal radiation dose

To address these issues, our multi-institutional consortium conceived of and set out to develop the next-generation dedicated PET technology, or total-breast PET, which would ultimately be compatible with MRI (an imaging tool with about 100% sensitivity but with highly variable specificity of 20%-90%) and its accessories.[1,2] Christiane Kuhl, MD, PhD, FSBI, and European colleagues had also realized the utility of dedicated PET/MRI.[10] With our approach, however, we intend to provide a larger, hence more sensitive, PET field of view that is identical to that of breast MRI. Our approach, presented at the 15th International Workshop on Breast Imaging (2020), answers the concerns listed above.

Extensive research demonstrates that image analytics for PET and MRI individually can be predictive of clinical and pathologic outcomes. Combined and correlated information from these highly complementary imaging modalities will provide more than just the sum of the two. Quantitative image analysis for radiomics, tumor heterogeneity, and clinical predictive models relies upon excellent spatial resolution, accurate coregistration, and quantitative accuracy. Using the latest combined MRI-compatible, high-sensitivity PET technology can facilitate optimal dual-modality imaging.

Along with using the appropriate radionuclide tracer, our proposed total-breast PET/MRI scanner has the potential to guide treatment decisions in patients undergoing chemotherapy by enabling assessment of morphology, blood flow, tumor permeability, tumor metabolism, heterogeneity, hypoxia, and receptor status. It will allow better assessment of early, middle, and late responses to chemotherapy. High-resolution total-breast PET imaging will enable selective imaging of the actual therapy target, such as estrogen receptors, allowing for prediction of response to targeted therapies, the ability to assess the target during therapy, and identification of nonresponders much earlier than is currently possible. Our proposed MRI-guided biopsy capability is essential to achieve this end and will allow the combined PET/MRI to selectively target and guide biopsy of breast cancer on the basis of its biologic phenotype.

Imaging of the axilla is also important because many women undergoing neoadjuvant chemotherapy have locally advanced disease including axillary metastasis. Further, there is strong interest in reducing overtreatment of breast lesions such as ductal carcinoma in situ, and combined breast MRI and PET may be able to accurately stratify lesions and assess progression or stability. Our proposed total-breast PET insert would also have the potential to improve the specificity of breast MRI, reduce biopsies of benign lesions, and improve our overall ability to detect and characterize breast cancer in vivo. The paradigm-changing noncircular design with adaptable reconstruction enables the technology to provide the high sensitivity with which this new information will be available.

References

1. Tornai MP, Samanta S, Majewski S, et al. High sensitivity dedicated dual-breast PET/MR imaging: concept and preliminary simulations. In: *Proceedings of the 15th International Workshop on Breast Imaging* (IWBI2020). SPIE; 2020:1151318. doi:10.1117/12.2563650
2. Samanta S, Jiang J, Hamdi M, et al. Performance comparison of a dedicated total breast PET system with a clinical whole-body PET system: a simulation study. *Phys Med Biol.* 2021;66(11). doi:10.1088/1361-6560/abfb16
3. Khalkhali I, Cutrone JA, Mena IG, et al. Scintimammography: the complementary role of Tc-99m sestamibi prone breast imaging for the diagnosis of breast carcinoma. *Radiology*. 1995;196(2):421-426. doi:10.1148/radiology.196.2.7617855
4. O'Connor M, Rhodes D, Hruska C. Molecular breast imaging. *Expert Rev Anticancer Ther*. 2009;9(8):1073-1080. doi:10.1586/era.09.75
5. Taillefer R. The role of 99mTc-sestamibi and other conventional radiopharmaceuticals in breast cancer diagnosis. *Semin Nucl Med*. 1999;29(1):16-40. doi:10.1016/s0001-2998(99)80027-0
6. Tafra L. Positron emission tomography (PET) and mammography (PEM) for breast cancer: importance to surgeons. *Ann Surg Oncol*. 2007;14(1):3-13. doi:10.1245/s10434-006-9019-7
7. Huppe AI, Mehta AK, Brem RF. Molecular breast imaging: a comprehensive review. *Semin Ultrasound CT MR*. 2018;39(1):60-69. doi:10.1053/j.sult.2017.10.001
8. Conners AL, Hruska CB, Tortorelli CL, et al. Lexicon for standardized interpretation of gamma camera molecular breast imaging: observer agreement and diagnostic accuracy. *Eur J Nucl Med Mol Imaging*. 2012;39(6):971-982. doi:10.1007/s00259-011-2054-z
9. Hsu DF, Freese DL, Levin CS. Breast-dedicated radionuclide imaging systems. *J Nucl Med*. 2016;57 Suppl 1:40S-45S. doi:10.2967/jnumed.115.157883
10. Kuhl C, Schultz V, Helbich T, et al. Novel PET/MRI technology for enhanced breast cancer diagnosis. *Diagnostic Imaging Europe*. November 2017:18-19.

Wendie Berg, MD, PhD, FACR, FSBI

By Danielle Sharek, MD

Danielle Sharek, MD

DS: Please tell me about yourself and your background.

WB: I was very much aware of my family risk of breast cancer even as a child. When I was 10, my father's sister died from breast cancer at age 60, after initial diagnosis at age 40. When I was in high school, my mother was diagnosed with cancer that didn't show on her mammogram when she noted nipple retraction at age 55. Mom participated in the first clinical trial of adjuvant chemotherapy for breast cancer, and that became the standard of care. I was determined to devote my career to improving early diagnosis of breast cancer for all women, potentially including myself.

How were you diagnosed with breast cancer?

In January 2014, Pennsylvania's density notification law went into effect that stated information was being provided to raise awareness "and to inform…conversations with your physician." A few months later, I spent about half an hour discussing the issues with my internist to help prepare him for discussions with other patients. I sent him our *JAMA* 2012 paper on supplemental screening ultrasound (US) and magnetic resonance imaging (MRI) in the ACRIN [American College of Radiology Imaging Network] 6666 study as well as the Saslow 2007 American Cancer Society guideline on screening MRI and links to the Tyrer-Cuzick model. A few months later, I was revising the chapter on risk models for the second edition of *Diagnostic Imaging: Breast*. I plugged my risk factors into the Tyrer-Cuzick model, and my estimated lifetime risk was 19.7%. My breasts are dense and my tomosynthesis was normal, even in retrospect. I figured it would be less stressful for our technologists if I had additional screening with MRI instead of screening US. I emailed my internist for a prescription, and his response was "Remind me why you want this?" I had the MRI and tried to let it go through usual channels, but I couldn't resist taking a look. I saw the 1-cm spiculated enhancing mass in my right breast and called my husband and told him, "I have cancer." My colleague did the biopsy under US a few hours later.

How did you feel when you learned of the news?

I completely expected it at some point and was relieved it was caught early.

What was your treatment process? Did you face any treatment obstacles? How did you overcome them?

The surgeon happened to have a cancellation a week after my core biopsy. I thought this was a good thing until I later learned that the sooner after core biopsy one has surgery, the more sentinel nodes tend to be found. They took seven, all negative.

A few days after surgery, I was helping my daughter pack for college. I knew not to do any heavy lifting. I was folding her clothes. I developed a large axillary hematoma and afterwards was told that repetitive motion of that arm should have been avoided. The upper arm numbness recently resolved, but not before about six months of hyperesthesia.

At the conclusion of four weeks of radiation therapy, I had bleeding skin moles at the edges of my breast. I saw my dermatologist who removed them. I awoke the next morning, a Saturday, with intense mastitis and fever. Fortunately, I had Bactrim [sulfamethoxazole/trimethoprim] on hand. My radiation oncologist told me I should not have had the skin lesions removed.

What motivated you during your diagnosis and treatment process?

I wanted to minimize morbidity. It is for that reason that I insisted on having prone radiation—to minimize lung scarring. The downside was that every day, the therapists would say, "We've never done this before." As a patient, that is not what one wants to hear, but we got through it.

I was recommended to take aromatase inhibitors, and I tried several over the course of about eight months. I found I felt at least 15 years older—pain in my knees was intense, to the point that it was difficult to get out of the car. This is a common experience. My risk of distant recurrence was 4% if I took aromatase inhibitors and 8% without. I decided I would rather take my chances.

What did you learn from your experience?

The binder that was given to me by the surgeon to guide me through the process was well-intentioned and helpful. However, I found that it had many typographical errors and wrong words in it. Seeing this reinforced in me the great importance of taking care in communicating with patients. Indeed, we all have a lot of work to do to improve communications.

How has this diagnosis impacted your life?

I am lucky. When found early, breast cancer is a minor bump in the road. I did not need chemotherapy.

As a radiologist, what lessons do you think the breast imaging community can learn from your experience?

My experience has made me impatient with guidelines that continue to rely largely on mammography even though we know it is relatively ineffective in women with dense breasts. Every woman should have access to screening that is appropriate for her. It is time to implement the technologies we know work better and to educate patients and providers about these options. My experience with my physician prompted me to help advocate JoAnn Pushkin and technologist Cindy Henke launch the website DenseBreast-info.org in 2015 to help educate patients and providers. We are now working to improve communication and action items with help from a health literacy expert.

Breast imaging reports were developed to communicate with other health care providers but are now released directly to patients. BI-RADS was not developed to communicate with patients. We need to make a far greater effort to assure that our words are understood by our patients. Our reports should provide information and not increase confusion and stress. Only then can women make informed decisions about their own care.

What advice would you give to other patients who are going through the diagnosis and treatment process for breast cancer?

Ask about every procedure and medication, including the risks and alternatives, so you can make an informed choice at each step. One feels very vulnerable as a patient. You can regain a small sense of control by at least feeling you are making informed choices. You can influence the course of your care so that it reflects your personal desires with regard to potential benefits and your own tolerance for the downsides of procedures and medications.

Wendie Berg, MD, PhD, FACR, FSBI

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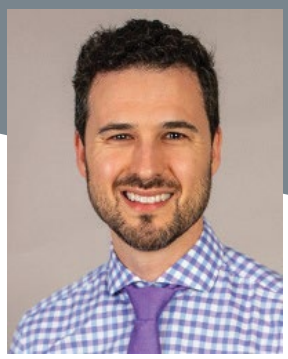

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