**President’s Column**

Of all of our society’s missions, education is probably the most important. Over the years, our biennial postgraduate course has improved in stature and scope to become the preeminent meeting in breast imaging education. Our last meeting in San Antonio, Texas during the spring of 2011 was the largest ever, with over 800 participants. We started new sessions to give attendees more access to our expert faculty, included self-assessment modules (SAMS), and offered a wide array of lectures and workshops. The 2013 Society of Breast Imaging (SBI) meeting will include representation from the European Society of Breast Imaging (EUSOBI) for the first time. Readers of this newsletter will remember that SBI participated in the EUSOBI 2012 meeting to begin our international cooperation.

In 2015, our meeting will undergo new, significant changes. I am pleased to announce that beginning in 2015, the SBI meeting will become an annual event. In the past, we have alternated with the American College of Radiology (ACR) in presenting a breast imaging educational meeting in the spring. We have always enjoyed a supportive and collegial relationship with our colleagues in the ACR Commission on Breast Imaging, who run the ACR’s National Conference on Breast Cancer (NCBC). The SBI Board of Directors considered a yearly meeting but did not want to become a competitor to the ACR’s efforts.

Fortunately, the ACR was seeking to expand their offerings to their members and approached the SBI for input. Dr. Paul Ellenbogen, Chair of the Board of Chancellors of the ACR, and I discussed the goals and opportunities for the SBI in breast imaging education, which allowed for discussions of the yearly meeting. After much thought and thorough negotiations (which included Dr. Barbara Monsees, acting in her role as Chair of the ACR Commission on Breast Imaging, Dr. Bibb Allen, Vice-Chair of the ACR Board of Chancellors, and Pam Wilcox, RN, MBA, acting on behalf of both the ACR and the SBI) we came to an agreement that was mutually satisfactory to all parties. The support of Drs. Ellenbogen and Allen and the SBI for quality breast imaging education was critical to the success of these discussions.

The final result is that in 2015, which is SBI’s 30th anniversary, we will hold our first meeting that is planned as an annual event. The meeting will be re-titled and will reflect the long relationship between the SBI and the ACR. While we plan to include timely plenary sessions, workshops, and guest speakers from home and abroad as in past meetings, there is an additional significant change. This meeting will be the first to include scientific content. We will be accepting research abstracts to be presented as part of workshop sessions. The research abstracts will be an addition to the workshop schedule, not a replacement for it. The scientific sessions will allow breast imagers from

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**2013 SBI Postgraduate Course**

By Jay Baker, MD

The Society of Breast Imaging (SBI) will present its 11th biennial Postgraduate Course this spring in Los Angeles. From Saturday April 6 through Tuesday April 9, 2013, the course will be held at the iconic Hyatt Regency Century Plaza, which was built on a former back lot of 20th Century Studios near Beverly Hills. The course was organized by a team of fourteen SBI fellows led by Program Chair Dr. Murray Rebner of William Beaumont Hospital and will include a keynote address, sixteen plenary sessions, forty refresher courses, three debates and one competition pitting the audience against the faculty.

This year’s keynote address, the Gerald Dodd Lecture, will be presented by Dr. Armando Giuliano from the Samuel Oschin Comprehensive Cancer Institute at Cedars-Sinai Medical Center in Los Angeles. Dr. Giuliano is a well-known breast surgeon who will discuss the role of sentinel lymph node evaluation in the work-up and treatment of newly diagnosed breast cancer. Dr. Giuliano brings a unique perspective to this issue as he was the lead investigator of the American College of Surgeons Oncology Group (ACOSOG) Z0011 trial that evaluated the utility of complete axillary node dissection in women with early stage breast cancer and a positive sentinel lymph node biopsy.

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**INSIDE...**

Editor’s Note ......................................................... 2
Axillary Lymph Node Biopsy: More Questions Than Answers? .......................... 4
RSNA 2012 Mammography Recap ...................................................... 5
Breast Ultrasound at RSNA 2012 ...................................................... 6
SBI Fellows Meeting at RSNA 2012 ...................................................... 7
Meaningful Use of Electronic Health Records: Part I ............................. 8
American College of Radiology Mammography Accreditation Committee Update .................. 9
SBI Awards Six New Fellows ...................................................... 9
Posterior and Medial Breast Tissue: Potential Mammographic Blind Spots .................. 10
Tricks of the Trade: Mammographic-Sonographic Correlation .................. 11
SBI Staffing Update ...................................................... 12
Upcoming Events & Activities ...................................................... 12
Radiation Dose Levels in the Diagnostic Breast Examination .................. 13
Imaging Informatics and Breast Imaging: A Fellowship Experience .................. 15

continued on page 2

continued on page 3
Editor’s Note

In this issue, Dr. Debra Monticciolo contributes her last president’s column. In April, Debbie will complete her two year term as the president of the Society of Breast Imaging (SBI). We thank Dr. Monticciolo for a job well done! The SBI is strong and getting stronger (see the article by Dr. Jokich on page 7), and Debbie has played major roles in nearly every facet of the SBI over the last few years.

Debbie has been an extremely strong supporter of the SBI Newsletter. She has been easy to work for/with, offering sound advice on a host of issues over the last two years. Debbie: thank you!

We look forward to working with the next SBI president, Dr. Murray Rebner. I have known Murray for a while, and I anticipate continued growth in the SBI under his leadership.

I see the SBI’s growth in terms of more members and more engagement. I have been the beneficiary of an enthusiastic, engaged, insightful SBI Newsletter editorial board. As soon as one issue is completed, the editorial board is at work on the next issue. We assemble ideas for possible articles during quarterly conference calls—trying to determine what is important for you to know. We welcome your suggestions regarding possible topics for articles. We also want your feedback on what you see in the newsletter. What type of articles are most useful to you? We want to provide you what you need in the ever changing world of breast imaging. Please let me know your thoughts at sbi@acr.org.

Gary J. Whitman, MD

President’s Column, continued from page 1

Across the nation and internationally to present their work to like-minded individuals at the top of their profession and to those who wish to utilize the most current ideas in their practices.

The ACR is also expanding its annual meeting in 2015, to offer content centered on the five pillars of the College: advocacy, economics, education, quality and safety, and clinical research. As SBI is considered the leader in breast imaging education, we have been asked to assist in meeting those needs as they arise in the new ACR educational format. This is an excellent opportunity for the SBI and a role we eagerly accepted.

The SBI’s mission is to save lives through early detection, quality education, and trusted information provided to patients, physicians and organizations worldwide. Increasing the frequency of our national meeting and expanding its scope and quality is in keeping with that mission and consistent with the core values of our society. Our core values include providing world class educational programs to advance knowledge and clinical care, providing trusted information and solid science for optimal decision making, and undertaking collaborations with colleagues and organizations to enhance our collective knowledge. As our meeting grows and expands, we hope to continue to lead breast imaging education long into the future.

Debra L. Monticciolo, MD
President, Society of Breast Imaging
For the remaining lectures, the seventy-seven faculty are drawn primarily from among the fellows of the SBI. Saturday's plenary sessions will provide an update on screening and the state of breast imaging. Lectures will include a discussion of the politics of breast imaging including the recent controversies surrounding screening mammography and the issue of breast density as well as a discussion of alternative screening modalities including ultrasound and MRI. The controversy over the pros and cons of screening ultrasound will be presented using a new approach in this year's course – a debate. Drs. Carol Lee and Valerie Jackson will present differing viewpoints using a format that allows ten minute presentations by each speaker, followed by five minute rebuttals. No doubt the three debates throughout the course will offer an opportunity for spirited discussions.

Other plenary session topics include Sunday's session on the applications of digital technologies. This session will be devoted to current research data and practical applications of breast tomosynthesis along with newly emerging digital technologies. Management of specific breast lesions will be the focus of Monday's plenary session. These talks will cover recommendations for managing high risk lesions, BI-RADS® category 3 lesions, discordant biopsies, and breast imaging emergencies and complications. Dr. Rena Callahan, an oncologist from the University of California Los Angeles (UCLA), will discuss new molecular classifications of breast cancers and the potential impact on treatment decisions. The second debate of the course will feature Drs. Constance Lehman and Elizabeth Morris deliberating over the frequently contentious topic of pre-operative MRI in the work-up and treatment of breast cancer.

Finally, Tuesday's plenary session topics will focus largely on informatics in breast imaging. Experts among the SBI fellows will discuss the effect of healthcare reform on the world of breast imaging as well as the use of informatics in the reporting and accessing of information. Dr. Carl D’Orsi will provide an update on the much anticipated 5th edition of the Breast Imaging Reporting and Data System (BI-RADS®). The final debate of the course will match Drs. Jessica Leung and John Lewin in a discussion about the role of nuclear medicine in breast imaging.

The refresher course topics include a wide range of subjects certain to be interesting to breast imagers. These lectures will review mammographic, sonographic, and MRI evaluation of breast lesions. Several challenging case conferences will be presented as well as other topics of interest including discussions of medicolegal issues, accreditation, and economics of breast imaging. Included in the refresher courses are five Q&A Roundtables with the Experts. These roundtable discussions were first introduced at the 2011 Postgraduate Course and were extremely well received. Attendees will have the opportunity to discuss important topics and ask questions of a panel of three or four expert breast imagers who will offer broad perspectives on the field. Questions can be raised during the discussion or can be submitted in advance on the SBI website. This year's Q&A Roundtable topics include ideas on running an efficient practice; using BI-RADS® appropriately in daily practice; working in an interdisciplinary environment; overcoming imaging challenges; and dealing with difficult people.

The final session in 2013, Diagnosing with the Stars Case Challenge, is a new concept for the SBI Postgraduate Course. The audience will participate in a spirited competition between attendees and a panel of experts. The faculty on the panel will discuss their thoughts on a series of unknown – and challenging – cases. After all of the talking is done, both the faculty and the audience will put their egos on the line as each votes on the most likely diagnosis. The audience can be assured of anonymity, but it should be entertaining to watch the faculty sweat. All this and more is available in Los Angeles this spring. Details and registration materials are available online at www.sbi-online.org.
Axillary Lymph Node Biopsy: More Questions Than Answers?

By Peter R Eby, MD

One of the things that I find most attractive about breast imaging as a career choice is the clear and consistent approach to evaluation, interpretation and assessment of abnormal findings. The Breast Imaging Reporting and Data System (BI-RADS®) atlas usually provides answers when I have questions. However, scientific techniques can outpace our ability to assess and incorporate them into the atlas. Percutaneous needle sampling of axillary lymph nodes falls into this category.

There was a time when incomplete resection of the level 1 and 2 axillary lymph nodes was considered ludicrous. But the development and validation of sentinel lymph node biopsy (SLNB) in the mid 1990s has reduced the risk of lymphedema, nerve injury and other debilitating complications of complete axillary lymph node dissection (ALND). The single downside to SLNB is the potential return to the operating room for completion ALND. In the last decade, surgeons and radiologists have discovered that preoperative axillary lymph node sampling can confirm the presence of metastases and improve patient care by decreasing the number of operations, the recovery time, the costs and the complications. As a result, demand for preoperative ultrasound-guided axillary nodal sampling has blossomed.

A quick search of PubMed using “axillary lymph node AND breast cancer AND needle biopsy” reveals 43 relevant articles published in 2012 alone. The BI-RADS atlas does say that “Enlarged round lymph nodes or those with small or no fatty hilar areas are abnormal, although there is no specific feature or finding to distinguish a nodal metastasis from a benign reactive node.” This gives us some general guidance about normal versus abnormal lymph nodes. But there are many variables to be accounted for when considering percutaneous sampling of an axillary lymph node. The three most salient questions are: What features establish suspicion? How should the biopsy be performed? How will the results impact treatment?

We can generally agree that an oval or reniform lymph node with a very thin, uniform cortex surrounding a large echogenic hilum is normal, regardless of size. And we can generally agree that a round uniformly hypoechoic node without an echogenic hilum is highly suspicious. But how do we handle lymph nodes that fall somewhere in between clearly normal and abnormal? Some recent publications have used cortical features such as thickness greater than 3 mm, a “focal bulge” or cortical Doppler flow as thresholds for recommending percutaneous needle sampling. Other markers for suspicion have included the ratio of the hilar thickness to the nodal thickness. The resulting sensitivities and specificities have varied widely depending on features and there is, as yet, no agreement on specific thresholds to apply to all cases.

After determining that a lymph node is abnormal should we use fine needle aspiration (FNA) or core needle biopsy (CNB) to obtain a sample? FNA has the theoretical advantage of being more comfortable for the patient with a lower likelihood of complications. However, the smaller needles can be very difficult to see with ultrasound, an experienced cytologist is needed and inadequate samples are common. CNB samples contain more tissue and can be read by any pathologist, but there is potential for greater complications due to the larger needle size and firing into an area of large vessels and delicate nerves. Some recent research has attempted to answer this question. Most published reports describe retrospective reviews of single institution experience without pre-determined algorithms for deciding on FNA or CNB. Many have indicated a trend towards greater accuracy with core needles without significant differences. Such results may be related to small sample sizes or bias from the lack of randomization. In addition, most retrospective reports do not include standardized reporting of complications and patient comfort and do not address the theoretical limitations associated with CNB.

How do the results of the biopsy impact the patient? Standard practice has allowed patients with a positive biopsy to proceed directly to ALND. But in 2011, the American College of Surgeons Oncology Group (ACOSOG) published results from the Z0011 trial in which patients with one or two positive nodes at SLNB were randomized to completion ALND or no further lymph node dissection. Caudle et al noted no significant difference in local-regional recurrence or overall survival in the Annals of Surgical Oncology in 2011 (1). Such a revelation – eliminating ALND - would have an immediate and far-reaching impact on many women. In addition, it could make ultrasound-guided percutaneous lymph node biopsy obsolete. However, a closer look at the results show that the patient population for which ALND had no effect was a small and in a very specific group, including patients with clinical T1 or T2 N0 M0 invasive cancer who had one or two positive lymph nodes at SLNB. A recent analysis of the BreastSurgANZ National Breast Cancer Audit database by Ainsworth (2) et al suggests that this group accounts for only 6.9% of all breast cancer patients. Thus, there are still many breast cancer patients who need ALND. And there is still a need for our ultrasound skills and our percutaneous sampling skills because nobody will know if there are more than two positive nodes until a SLNB has been performed. The real question now is whether a patient with a single positive axillary node proven by CNB needs SLNB, ALND or no additional sampling.

There are many questions to be answered. Perhaps in the future we will develop highly accurate and minimally or non-invasive techniques to determine nodal status. Between now and then, we may consider adding axillary ultrasound to all patients with breast masses before any biopsy is performed. Staying true to our BI-RADS roots, we can hope to establish uniform criteria for when percutaneous sampling has a high likelihood of benefiting the patient by decreasing the cost, the number of surgical procedures, and the number of complications.

References
The 2012 Radiological Society of North America (RSNA) annual meeting featured excellent presentations as the seemingly mature field of x-ray imaging of the breast made large strides forward. Mammography research largely comprised three topics: breast tomosynthesis; screening guidelines; and dose.

Digital tomosynthesis remained among the “hot” topics in breast imaging research at RSNA in 2012. Studies have evolved from a handful of cases at single institutions to thousands of cases often interpreted at multiple institutions, improving the reliability of the work. In a study of over 4,000 patients and thirteen radiologists, the combination of digital tomosynthesis and routine digital full field mammography (FFDM) provided a statistically significant 35% lower recall rate compared with FFDM alone (5.8% versus 8.8%). A separate report on approximately 5,600 patients confirmed that performing tomosynthesis in addition to routine FFDM offered a significantly greater cancer detection rate than conventional digital mammography alone (2.33% versus 1.5%). This represents a 55% improvement in the cancer detection rate for the combination of conventional mammography plus digital tomosynthesis.

In a purely screening population, digital tomosynthesis in addition to conventional digital mammography was also found to provide superior outcomes to conventional FFDM alone. In a study of 5,780 patients including 1602 who received digital tomosynthesis and FFDM, the combination led to a recall rate of 7.0% compared with a statistically significantly greater recall rate of 10.9% for conventional FFDM alone. Cancer detection rates trended greater for tomosynthesis in this screening trial (5.6 per 1000) compared with FFDM alone (3.4 per 1000) although the difference was not statistically significant. The greatest differences in performance were noted for women younger than 50 years old and women with dense breast tissue.

Other research presented at RSNA included efforts to assess the effects of the 2009 United States Preventative Services Task Force (USPSTF) screening guidelines recommending only biennial screening between the ages of 50 – 74 years. In a comprehensive review of a large Medicare payment database, screening rates per 1000 female Medicare beneficiaries were found to increase at a compound annual growth rate of 0.9% each year from 2005 to 2009. In 2010, however, after the new guidelines were released, the rate declined 4.3%, suggesting a substantial impact of the new specifications. A separate retrospective review of over 43,000 screening mammograms found that women in their 40s accounted for one third of the examinations performed and 19% of the cancers detected. Only 7.7% of women in their 40s who were diagnosed with breast cancer had a strong family history.

An important study was presented that addressed an earlier controversy in the lay press about the risk of scattered radiation from mammography to the thyroid, salivary gland, lens of the eye, sternum, and uterus. This study, which was performed by placing dosimeters on over 100 subjects, confirmed that the risk of cancer induction at each of the tested locations was indistinguishable from the usual, background risk.

At RSNA 2012, mammography research propelled the field forward with reports on new imaging techniques and studies that addressed longstanding concerns regarding dose.
Ultrasound-based applications in breast imaging were discussed in several scientific papers at the 2012 Radiological Society of North America (RSNA) meeting. The major themes included screening, elastography, and strategies to improve the positive predictive value.

On Sunday, November 25th, Wendie Berg, MD, PhD began the scientific session with a hypothetical scenario in which ultrasound was the only screening test for breast cancer. She explained that in much of the developing world, where 23% of cancers occur in women under age 49 years, ultrasound is inexpensive and more widely available than mammography. Using data from the American College of Radiology Imaging Network (ACRIN) 6666 trial that tested hand-held screening breast ultrasound in women with dense breasts, she concluded that if ultrasound were the only test, the false positive rate would start high but decrease in subsequent rounds of screening. In addition, ultrasound would detect invasive cancer as often as mammography, but ultrasound-detected cancers would be more likely to be node negative.

Additional presentations from the Sunday session included a retrospective analysis of errors made when 335 cancers were missed on mammography but detected on screening breast ultrasound between 2003 and 2011 in a population of patients with predominately heterogeneous (56%) or extremely dense (33%) breast tissue by Min Sun Bae, MD et al, from Seoul, Korea. Only 19% of the mammography cases were considered “interpretation” type errors. Seventy-eight percent of the mammographically “missed” cancers simply could not be seen. The authors concluded that ultrasound could be helpful in detecting cancers in patients with dense breasts. Rachel Brem, MD discussed data from a trial using automated breast ultrasound (ABUS). She concluded that cancers detected with this modality are most often early stage tumors and node negative. She suggested that ABUS may be a useful test for average risk women with dense breast tissue who do not qualify for screening breast ultrasound.

Young Kim, MD et al found that adding elastography to B-mode imaging in the morning session devoted to new technology in Breast Imaging. He explained that static (also known as strain) elastography provides a qualitative measure of stiffness, is more operator-dependent and can be added to most new machines. Shear wave elastography yields a quantitative measure of stiffness, is much less operator-dependent but requires high-powered parallel processing from a dedicated unit. He pointed out that elastography is not yet part of the Breast Imaging Reporting and Data System (BI-RADS®) lexicon partly due to the lack of standardization and partly due to the continued need for data supporting specific clinical scenarios and findings. He suggested that elastography may be particularly helpful in certain scenarios such as: 1) distinguishing complicated solid-appearing cysts from true solid masses; 2) downgrading BI-RADS 4a lesions to BI-RADS 3 lesions to avoid biopsy of findings with a low PPV; 3) upgrading very small lesions from BI-RADS 3 to 4 when the margins and the central echogenicity are difficult to resolve; and 4) assessment of axillary lymph nodes which may be stiffer in patients with metastases. The papers in the session subsequently touched on these subjects.

Following Dr. Stavros discussion, Wendie Berg MD, PhD presented findings from a multicenter trial in the United States and Europe testing the hypothesis that shear wave elastography could downgrade lesions from BI-RADS 3 to 2. Eleven of 440 (2.5%) BI-RADS 3 lesions were malignant and all demonstrated mid to high stiffness. The authors concluded that elastography may help to identify stiff BI-RADS 3 lesions for upgrade to biopsy. Multiple papers from Korea, where elastography has penetrated the clinical arena more widely were presented. A study by Jihe Lim et al indicated that all BI-RADS 3 lesions with very low stiffness (165/273) were benign, allowing a downgrade to BI-RADS 2 and the potential for a 60% reduction in follow-ups. A paper by Ann Yi, MD et al concluded that higher stiffness in primary tumors was predictive of axillary metastases in patients with normal clinical examinations. Mi Young Kim, MD et al found that adding elastography to B-mode ultrasound could improve the sensitivity and the specificity for malignant complex cystic and solid masses.

In summary, there was a wealth of ultrasound-related data presented at the RSNA 2012 meeting. With data from around the globe presented in at least three major sessions on a diverse range of topics, it is likely that we can expect an exciting expansion in the indications for ultrasound in the United States and around the world in the years to come.
The Society of Breast Imaging (SBI) fellows meeting at the 2012 Radiological Society of North America (RSNA) meeting took place on Monday evening, November 26, 2012, with Dr. Barbara Monsees, the chair of the fellows, presiding. Following the approval of the November 2011 meeting minutes, the new fellows of the Society were introduced. The new fellows are Priscilla J. Slanetz, M.D., M.P.H. from Beth Israel Deaconess Medical Center in Boston, MA; Catherine W. Piccoli, M.D. from South Jersey Radiology Associates in Voorhees, NJ; Christopher I. Flowers, M.B.B.S. from Moffit Cancer Center in Tampa, FL; Robert L. Gutierrez, M.D. from Group Health Cooperative in Tacoma, WA; Jules H. Sumkin, D.O. from Magee-Women’s Hospital in Pittsburgh, PA; and Margarita L. Zuley, M.D. from Magee-Women’s Hospital in Pittsburgh, PA.

Debra Monticciolo, M.D., SBI president, then gave her yearly report. Special thanks were given to Pam Wilcox, MBA, R.N., the Assistant Executive Director of the American College of Radiology (ACR) with the Commission on Quality and Safety, for all of her help over the past year.

Dr. Monticciolo discussed the four main areas of strategic planning for the SBI – education, communications, membership and organization/governance. Dr. Christopher Comstock is directing the new weekend courses, which focus on new technologies and MRI case-based reviews. The first new weekend course was held in Las Vegas, NV in September 2012 and the second course was held in Florida in January 2013. An updated teaching curriculum, a joint project with the ACR Breast Imaging Commission Education Subcommittee, was completed and published in the Journal of the American College of Radiology in December, 2012. A fellowship survey headed by Dr. Dione Farria, has been completed and the data is being analyzed. The maintenance of certification (MOC) committee, chaired by Dr. Mimi Newell, is working on self-assessment modules (SAMS) and practice quality improvement (PQI) products. The SAMS chair is Dr. Kate Appleton and the PQI chair is Dr. Heidi Umphrey.

In the communications arena, it was announced that the SBI website, led by Dr. Eric Rosen, is undergoing a major revision, with an upgrade for tablets and phones on the way. The website project will involve the SBI moving to a learning management system (LMS).

The rapid response committee, led by Dr. Phil Evans, issued numerous educational and media statements over the past year. The scientific advisory committee, led by Dr. Mark Helvie, aids the rapid response committee and plans to review screening statements.

Membership topics included the transition to a calendar year for membership and dues and the fellowship listings update. The first ever membership survey was completed in November, headed by Dr. Sujata Ghate and Abray Stillson.

The SBI helped to promote the International Day of Radiology and the Mammography Saves Lives Campaign and participated in the Intersociety Conference and the National Accreditation Program for Breast Centers (NAPBC) this year.

The SBI Gold Medal will be awarded to Dr. D. David Dershaw. The Honorary Fellow award will be given to Penny Butler, M.S. Congratulations were given to both very deserving individuals. The awards will be given at the SBI meeting in April 2013 in Los Angeles.

SBI Treasurer Dr. Elizabeth Morris gave her report on the financial status of the SBI, including assets, liabilities and total net assets, which increased from 2011 to 2012. Billing for 2014 dues will begin in August 2013. Total SBI membership for 2012 was 2,580, broken down into 1,770 regular members, 94 fellows, 53 affiliate members, 471 technologists, 8 honorary fellows, 161 retired members, and 23 emeritus fellows.

Jessica Leung, M.D. reported on the ACR Intersociety Conference entitled “Radiology Online: Information, Education, and Networking”, which was held in Telluride, CO on August 3-4, 2012. Dr. Monticciolo and Abray Stillson also attended the conference. The conference focused on how to harness technology to enhance education and clinical care. Topics included social networking, government and consumer expectations, and opportunities for efficiency, mobility, personalization and timeliness. In the clinical realm, the use of optimized, accessible, context-specific reports was discussed, which would include images, charts and diagrams, hyperlinks, and possible virtual consultations, thereby improving communication and collaboration. In education, a goal was to promote active participation in learning and to develop massive open online courses and special tools for radiology residents. Another goal was to develop a common radiology website using one logon with continuing medical education (CME) information/ratings, calendars and online resources.

Dr. Gary Whitman gave an update on radiology participation in the NAPBC, which currently has eight radiology representatives on its multidisciplinary board. The organization has a voluntary three-year accreditation cycle, and currently, there are 436 accredited centers in 48 states, ranging from free-standing centers to large medical institutions. NAPBC recently agreed to endorse the ACR screening mammography guidelines. Recent issues discussed by the NAPBC board include having accurate profile pages for each accredited center on the website with updated rosters of the participating physicians.

Dr. Ed Sickles provided information on the European Society of Breast Imaging, which held its annual scientific meeting in Barcelona, Spain on October 12-13, 2012. The meeting attracted 500 participants, and the society has grown to 350 members. For the first time, the European Diploma in Breast Imaging was offered, a common European qualification for breast imagers, which will help to standardize training and expertise across Europe. Future meetings will be held in mid-October in Rome (2013), Nijmegen, Netherlands (2014) and in the United Kingdom (2015).

Dr. Barbara Monsees, the chair of the ACR Commission on Breast Imaging, gave her report. Dr. Monsees reported that the Communications Subcommittee is perpetually active and that the ACR Economics Commission, chaired by Geraldine McGinty, a breast imager, is currently working on coding issues related to breast ultrasound and tomosynthesis. The updated Breast Imaging Reporting and Data System (BI-RADS®) is scheduled for publication in the near future, with nearly 1000 names on a waiting list.

Dr. Monsees noted that the American Medical Association (AMA) recently considered the issue of screening mammography for women age 40-49 years, and a policy was adopted that was acceptable to the ACR contingent. AMA Policy H-525.993,
Screening Mammography, states that the AMA: “recognizes the mortality reduction benefit of screening mammography and supports its use as a tool to detect breast cancer…recognizes that as with all medical screening procedures there are small, but not inconsequential associated risks including false positive and false negative results and overdiagnosis….believes that beginning at the age of 40 years, all women should be eligible for screening mammography….supports insurance coverage for screening mammography.”

A spirited discussion then ensued about the recent New England Journal of Medicine article by Bleyer and Welch on overdiagnosis by screening mammography and breast density legislation and what the ACR and SBI have done regarding these issues.

Meaningful Use of Electronic Health Records: Part I

By Bernadette Redd, MD

The use of electronic health records (EHRs) in various forms has been steadily increasing in the United States over the past two decades. The practice of radiology in particular has undergone a sea change due to technical advances that affect the day-to-day practice of imaging-related health care. Changes in the practice of radiology due to the ascendancy of EHRs will only increase in the near future.

The driving forces behind the development of EHRs in the past were mainly organizational: goals were to improve efficiency and productivity in the delivery of patient care. Picture archiving and communication systems (PACS), EHRs commonly used by radiologists, have revolutionized the practice of radiology, allowing radiologists very rapid and convenient access to multiple imaging studies and reports for patients through an electronic database. The Health Information and Technology for Economic and Clinical Health Act (HITECH), enacted as part of the American Recovery and Investment Act of 2009, raised the bar for EHRs. HITECH was signed into law not only to promote the adoption of EHRs, but also to ensure that the information gained from the use of new technology is used to improve the quality of patient care, so-called “meaningful use (1, 2).”

HITECH authorizes five years of financial incentive payments through Medicare and Medicaid to health care providers when they use EHRs to improve patient care in certifiable ways. Penalties for noncompliance with the Medicare legislation come into play after five years (1-3). Currently, billing data from Medicare and Medicaid are used to assess the overall health status of a given population and appropriateness of overall patient care. It is hoped that more relevant clinical and demographic data, gleaned from a more detailed EHR, can be used to provide higher quality, more cost-effective patient care. “The legislation ties payments specifically to the achievement of advances in health care processes and outcomes (2),”

Starting in 2011 and 2012, incentive payments of up to $44,000 through Medicare and $63,750 through Medicaid are available to qualified non-hospital-based clinicians over a five-year period. In order to receive the full incentive payment, a clinician had to sign up by the end of 2012. The majority of practicing radiologists (even those who spend a significant amount of time in a hospital setting) will fulfill the eligible professional (EP) requirements for non-hospital based physicians and are therefore eligible for the clinician incentive pay through Medicare. This group of non-hospital-based radiologists (EPs) will also be subject to penalties in the form of reduced Medicare payments beginning in 2015 for not demonstrating meaningful use. Radiologists working in a practice that is devoted almost exclusively (90% or more of services) to inpatient or emergency room care will not be eligible for this form of incentive pay. There is a Medicare/Medicaid program that applies to meaningful use of certified EHR technology for hospitals, as opposed to clinicians. A radiologist who provides care exclusively for hospital inpatients and emergency room patients would participate in this type of program, but would not be eligible for incentive pay and would not be penalized for noncompliance after 2015. In the hospital-based meaningful use program, the hospital is responsible for implementing the program. An EP program for Medicaid is also available to radiologists with higher incentive pay than in the Medicare program and without the future penalties for noncompliance, but it requires that non-hospital based physicians have at least 30% of their total patient volume caring for Medicaid patients. Most radiologists are probably not eligible for this incentive pay. A five-year hardship exemption is available to radiologists who feel they cannot meet the program requirements (1, 3).

In part II of this two part series, I will discuss the three stages of meaningful use and the objectives and requirements for each stage.

References

Have you visited the SBI Member Forum lately? Share your thoughts on the latest issues in breast imagining.
American College of Radiology
Mammography Accreditation Committee Update

By Phan T. Huynh, MD, FACR

The American College of Radiology (ACR) is the main accreditation body approved by the U.S. Food and Drug Administration (FDA) for both screen-film and designated full-field digital mammography (FFDM) systems. Clinical image and phantom image quality assessments are critical parts of the accreditation process and facilities must submit two clinical cases (one from a patient with fatty breasts and one from a patient with dense breasts) as well as an image of an ACR-approved phantom for review. Currently, digital images must be submitted as hardcopy images and be as close to “true size” as possible. Recently, the FDA issued a mandate that the submitted clinical and phantom images for accreditation would be changed to softcopy format in 2013.

Members of the ACR Mammography Accreditation Committee (MAC) met at the 2012 Radiological Society of North America (RSNA) annual meeting in Chicago and discussed the potential ramifications of this FDA mandate. Should facilities be able to submit their digital images online only or can they send their images on a storage device? In many of our experiences, access to these storage devices may not be universal. Can reviewers get access to the cases online through the ACR website with no interference from firewalls from their institutions?

Are there any legal issues affecting the ACR and the reviewers’ institutions? What are the potential difference in methods of review among the clinical image reviewers and the phantom image reviewers? Medical physicists may prefer to review phantom images on their private computers as many may not have access to high spatial resolution workstations. Breast imagers tend to prefer reviewing clinical images on high spatial resolution workstations as they may regard their private computers as not having adequate spatial resolution for careful image review. If the submitted images can be reviewed on private computers, is there a minimal requirement for the monitor resolution? A pilot study is planned to tackle these issues as the ACR continues to work closely with the FDA in the transition for submission of clinical and phantom images from hardcopy to softcopy format in the very near future.

SBI Awards Six New Fellows

On November 26, 2012 at the SBI Fellows Meeting during RSNA in Chicago, six members were recognized and presented as new Fellows of the Society. Please join us in congratulating:

Jules H. Sumkin, DO, Chief of Radiology of Magee-Womens Hospital, and serves as the Chief of the Women’s Imaging Division for the Department of Radiology of the University Of Pittsburgh Department Of Radiology. Dr. Sumkin was recently awarded the UPMC Endowed Chair for Women’s Imaging at the University of Pittsburgh, School of Medicine.

Margarita L. Zuley, MD, Associate Professor of Radiology at the University of Pittsburgh and the Medical Director of Breast Imaging at Magee-Womens Hospital. She sits on several committees for the American College of Radiology, the American Board of Radiology and the Society of Breast Imaging.

Robert L. Gutierrez, MD, Staff Radiologist with Group Health Cooperative in Washington State. Previously, Dr. Gutierrez worked as an Assistant Professor of Radiology at the University of Washington from 2008 to 2012, during which time he was actively involved in Breast MRI research and together with his colleagues published 16 peer-reviewed manuscripts.

Christopher I. Flowers, MBBS, Director of Breast Imaging and Research at Moffitt Cancer Center. Originally from the U.K., Dr. Flowers has been a breast imager since 1987 from the start of national breast screening programs in Europe.

Priscilla J. Slanetz, MD, MPH, Associate Professor of Radiology at Harvard Medical School and is the Program Director of the residency in diagnostic radiology at Beth Israel Deaconess Medical Center in Boston, MA. Her current research interests lie with evaluating new breast imaging modalities and developing and assessing innovative educational curricula related to professionalism and resident teaching skills.

Catherine W. Piccoli, MD, Director of Women’s Imaging at South Jersey Radiology Associates in Voorhees, NJ. Dr. Piccoli has been principal investigator or co-investigator on 15 NIH, DOD and ACRIN grants, several drug trials and remains active in technology feasibility studies.
One of the primary goals of any screening mammogram should be to include as much breast tissue as possible on the images in order to facilitate an accurate diagnosis. The technologist performing the examination must work with the patient to achieve optimal positioning with each exposure obtained. However, because of the inherent geometry of the breast and the chest wall, some breast tissue will be excluded no matter how well the patient is positioned. The posterior and medial tissues are two areas of the breast which are most commonly incompletely imaged on screening mammography. These areas have a tendency to slip out from under the compression plate and therefore may not be completely included on the standard craniocaudal (CC) and mediolateral oblique (MLO) views. The medial portion of the breast is also farthest away from the detector when an MLO view is obtained, resulting in geometric unsharpness of the medial region. Presented below is a case demonstrating the challenges encountered with posterior and/or medial breast lesions and the benefits of additional projections and imaging modalities.

A fifty-year-old woman presented for her baseline screening mammogram with no significant past breast history provided. The interpreting radiologist identified two indeterminate groups of calcifications within the left breast 6 o’clock location anteriorly and a partially imaged high density asymmetry within the left breast in the posterior medial region, seen on the CC view only (Figure 1a). A BI RADS® category 0 assessment was given and the patient was recalled for additional imaging. Spot magnification views of the 6 o’clock calcifications demonstrated two groups of heterogeneous calcifications suspicious for malignancy and further evaluation with stereotactic biopsy was recommended. A medially exaggerated CC view was obtained to evaluate the posterior asymmetry with no suspicious findings identified. This finding, which had been noted on the CC view, was presumed to have represented superimposition of normal breast tissues.

Pathology of the biopsied calcifications revealed ductal carcinoma in situ (DCIS) and further evaluation with MRI was performed to evaluate the extent of disease and for contralateral surveillance. MRI demonstrated post-biopsy changes in the left breast 6 o’clock location anteriorly. In addition, a 2.2 cm rim-enhancing irregular mass was also present in the left breast posteriorly in the 7 o’clock location (Figure 1b), highly suspicious for malignancy. A subsequent left lateromedial view and an ultrasound confirmed that this mass represented the asymmetry first identified on the initial baseline CC view. Ultrasound-guided biopsy was performed, demonstrating invasive ductal carcinoma.

This case shows the importance of appropriate mammographic positioning with respect to the inclusion of the posterior and the medial breast tissue (1). These two areas are often mammographic blind spots, not completely included on the standard CC and MLO views (2). A lateromedial and a cleavage view at the time of the initial diagnostic work-up images would have likely been sufficient to demonstrate the 7 o’clock mass and lead to further ultrasound evaluation and eventual biopsy. Fortunately in this case, the mass was discovered without a delay in the patient’s treatment and a favorable outcome was achieved.

References
Tricks of the Trade: Mammographic-Sonographic Correlation

By Lisa Arnall, RDMS

While mammography is still the “gold standard” when it comes to screening breast examinations, ultrasound has provided radiologists with valuable information in recent years. Rather than one imaging tool being deemed superior to the other, mammography and ultrasound are considered complementary modalities, providing comprehensive and effective imaging.

When correlating a mammogram with an ultrasound, the radiologist looks not only for the proper location of the mass or the asymmetry, but also assesses its characteristics. Does the finding have vascular flow? Does it lie parallel or anti-parallel to the chest wall? Is the finding a solid tumor or a fluid filled cyst? Are the margins smooth, microlobulated, macrolobulated, angular, or spiculated? Are there associated microcalcifications? Is there an echogenic halo around the mass or asymmetry? All of these descriptive characteristics lead the radiologist toward classifying a finding as normal, benign, probably benign, indeterminate, suspicious, or a probable malignancy.

Ultrasound can add to the mammographic findings by confirming the presence of an abnormality, supplying the radiologist with more information about the original finding, or by indicating that the original finding was not real. First, it is important for sonographers to familiarize themselves with mammographic interpretation. This will enable the sonographers to determine the location of the mammographic finding. For example, if a mass or an asymmetry is seen in the upper medial portion of the left breast, the sonographer will be guided to scan the 9 o’clock to 12 o’clock region. Keep in mind, a finding in a large, pendulant breast may be located slightly outside of the expected location. If nothing is seen in the area the radiologist anticipated, it is wise to explore outside of the targeted area.

How do you confidently locate “the needle in the haystack”? Patience and persistence are essential. Some mammographic findings may only measure 3-4 mm in size. A mass or an asymmetry may have the same echogenicity as the surrounding tissue. Findings surrounded by dense tissue may be “shadowed out” or too posterior for the ultrasound beam to penetrate. Another key element to look for on the mammogram, in addition to the approximate location of the abnormality, is where it “lies” in the breast tissue. Is the finding in the anterior, middle, or posterior aspect of the breast? Is the finding in the central aspect of the breast? Is it surrounded by fat or hiding in the fibroglandular tissue? Is the finding high in the axillary tail? Is it medial or lateral to the nipple?

An ultrasound should begin by scanning the quadrant or region of interest. This is done in a meticulous, methodical manner. Be sure to optimize your image depth so you can see slightly beyond the ribs. When an abnormality is seen, it is important to document the location thoroughly. Identify which breast you are scanning. What is the position of the transducer: radial, anti-radial, sagittal, transverse, or oblique? Document in centimeters how far the finding is from the nipple. What is the specific o’clock position? What is the patient’s positioning: right posterior oblique, left posterior oblique, supine, decubitus, or sitting up?

What if you scan the entire breast and are unable to find a correlate for the mammographic finding? It is then time for the sonographer to get creative. Change the patient’s positioning. If the patient is positioned obliquely, try scanning the patient supine. Maybe the patient is not oblique enough; try scanning the patient in the decubitus position. Change the patient’s arm placement. If you were scanning with the arm above the head, place the arm by the patient’s side. If there is still no correlate identified and the area of interest is in the upper portion of the breast, sit the patient in the upright position and place the breast on a firm surface, such as a mammographic film plate. On the craniocaudal mammographic view, measure how many centimeters straight back from the nipple and how many centimeters medial or lateral to the nipple. Correlate those measurements with measurements on the patient’s breast, while the patient is still holding the firm apparatus under the appropriate breast. Scan the appropriate region to see if a correlate can be identified. Ultrasound can discern an abnormality from dense, normal breast tissue. On many occasions, I have found normal dense accessory tissue to correlate with a mammographic asymmetry in the axillary tail or the axilla. A mammographic finding may be sonographically occult, just as a sonographic finding may be mammographically occult.

As our imaging techniques continue to improve, I believe mammography and ultrasound will continue to be used as complementary tools in our ongoing efforts to provide effective prevention and diagnostic care to our patients.

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Mammography Saves Lives™
... one of them may be yours

www.SBI-online.org
SBI Staffing Update

By Debra Monticciolo, MD, FACR

Yasmeen Fields,
New Executive Director of SBI

It is with great pleasure that the Society of Breast Imaging (SBI) Board of Directors and I welcome our new Executive Director, Yasmeen Fields, to the society. Yasmeen has an outstanding background in education and is especially familiar with our subspecialty. After obtaining her degree in history, Ms. Fields initially worked as a seminar coordinator for the American Press Institute and became interested in the non-profit sector. She began working for the American College of Radiology (ACR) Education Department in 2006, where she successfully developed, implemented, and provided support structure for multiple educational programs. Yasmeen assisted in the development of the Radiology Education Alliance, obtained grants for live courses, and developed policies for the Live Meeting Program. The caliber of her work led to multiple promotions; in 2011, she became a department manager.

Ms. Fields is very familiar to many of us in breast imaging. In 2008, 2010, and 2012 she was responsible for the National Conference on Breast Cancer, a meeting that is a joint effort between the ACR Education and Breast Imaging Commissions. Her passion and enthusiasm for breast imaging and education prompted her to seek the Executive Director position at the SBI. Her superb background in education and strong managerial skills make Yasmeen a natural fit for the job.

Ms. Fields has already made a difference at the SBI. Yasmeen brings solid knowledge in areas SBI needs most. In addition, Ms. Fields has recently been accepted into the graduate program for non-profit management at Marymount University, which will only broaden her skill set. Yasmeen will be balancing that, and with her husband Bradford, caring for their children, 4-year-old aspiring ballerina Juliana and 2-year-old linebacker-in-training Tommy.

Please join me in welcoming Yasmeen Fields to the SBI as Executive Director. The entire SBI Board is thrilled to have someone as caring, dedicated, focused and energetic as Yasmeen at the helm.

Promotion for Abray Stillson

The SBI Board of Directors and I are also pleased to announce that Abray Stillson has been promoted to the position of Education Programs Manager. Abray’s promotion is timely and well deserved. Her new responsibilities include the management of all educational programs for the SBI as well as a continuation of the work she has been doing with our website, membership, committees, and the Board of Directors. Her manager, Yasmeen Fields commented that “In the short time I have been with the SBI, I have been impressed by her fortitude, positive attitude, and her willingness to take on any projects or assignments.” Those of you familiar with Abray’s work will certainly agree. The SBI is truly fortunate to have Abray with us and we look forward to her continued advancement in the Society.

Upcoming Events & Activities

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<tr>
<td>March 7 - Conference Call</td>
<td>Society of Breast Imaging Board of Directors Meeting</td>
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<td>April 6 - 9 - Los Angeles, CA</td>
<td>SBI 11th Postgraduate Course</td>
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<td>May 2 - Conference Call</td>
<td>Society of Breast Imaging Board of Directors Meeting</td>
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<td>May 4 - 8 - Washington, DC</td>
<td>ACR Annual Meeting &amp; Chapter Leadership Conference</td>
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<td>June 21-22 - Chicago, IL</td>
<td>Society of Breast Imaging Board of Directors Meeting</td>
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<td>July 11 - Conference Call</td>
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<td>July 19-21 - Big Sky, MT</td>
<td>Intersociety Summer Conference</td>
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<td>August 1 - Conference Call</td>
<td>Society of Breast Imaging Board of Directors Meeting</td>
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<td>September 28-29 - Las Vegas, NV</td>
<td>SBI Weekend Education Course</td>
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<td>October 3 - Conference Call</td>
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<td>November 7 - Conference Call</td>
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<td>November 24 - Chicago, IL</td>
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<td>November 25 - Chicago, IL</td>
<td>SBI Newsletter Committee Meeting</td>
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<td>November 25 - Chicago, IL</td>
<td>SBI Fellows Meeting - Reception &amp; Meeting</td>
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<th>2014</th>
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<tr>
<td>April 26-30 – Washington, DC</td>
<td>ACR Annual Meeting &amp; Chapter Leadership Conference</td>
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The screening examination for breast cancer has historically relied on two-view mammography in the United States, however when suspicious findings are identified by the interpreting physician during mammographic screening, standard-of-care requires that the woman undergo follow-up to evaluate potentially abnormal findings. These follow-up studies comprise the diagnostic breast examination. The goal of this article is to describe the radiation dose levels that result from x-ray based examinations performed as part of the diagnostic evaluation. Ultrasound and MRI do not involve the use of ionizing radiation and are not discussed. While positron emission mammography and breast specific gamma imaging do involve ionizing radiation, they are not used routinely and therefore will not be discussed here. The radiation dose from additional mammography views, magnification mammography, spot compression mammography, and tomosynthesis imaging will be considered. Breast tomosynthesis from one vendor is approved for screening as an adjunct to mammography, and the additional radiation dose from these studies is included when tomosynthesis exams are used in a follow-up capacity. These data should be useful for estimating the total dose from both screening and diagnostic evaluation.

The literature in regards to the radiation consequences of the additional views used in the diagnostic breast examination is relatively sparse (1,2) and is specific to screen-film mammography. Digital mammography systems tend to use slightly higher x-ray tube potential (kV) and lower dose levels than screen-film systems, and clearly dose levels derived from digital imaging technology are most relevant to modern practice. Consequently, we performed a limited survey of technique factors for digital mammography, tomosynthesis, magnification views, and spot views at our institution. While the technical factors (kV, mAs, filtration) may be slightly different in digital breast imaging compared to screen-film imaging, the normalized glandular dose coefficients (DgN) values (3, 4, 5) are the same when technique factors are considered.

**Approach:** Mammograms, additional mammographic views, and the magnification and spot views were acquired on three digital mammography systems (Selenia, Hologic Corporation, Bedford, MA) in a research laboratory immediately adjacent to the breast imaging clinic at our institution. Tomosynthesis was performed on a prototype unit (Dimensions, Hologic Corporation, Bedford, MA) in a research laboratory immediately adjacent to the breast imaging clinic. This tomosynthesis system is identical to the Hologic tomosynthesis units approved for clinical use. A total of 20 cases of magnification mammography, 20 cases of spot compression mammography, and 64 tomosynthesis studies were initially evaluated. Two of the spot compression cases were found to have breast implants and were excluded. The remaining 18 patients had a total of 30 spot compression views. Twenty patients undergoing magnification views had a total of 34 views. The technique factors from a cohort of 64 women who underwent tomosynthesis as part of a research trial were included. A total of 211 imaging procedures and the accompanying technical factors allowed the computation of mean glandular dose (MGD) for each case. The technical details of the dose assessment are described in the Appendix.

Magnification views use a breast platform positioned 30 cm closer to the focal spot. Portions of the breast are not imaged in this geometry, and therefore the breast volume is partially irradiated by the primary radiation field. In all cases, the small focal spot (0.1 mm) is used and the anti-scatter grid is retracted. Compression is achieved by using a flat compression device or a spot compression device specifically designed for magnification exams.

Spot compression views are also performed with contact breast imaging, using a small-diameter compression device in lieu of the flat compression paddle. The spot compression device compresses tissue over the surface of the paddle, but at our institution the tissue peripheral to the compression paddle is also in the x-ray field of view. Thus, the entire breast is irradiated in this procedure.

**Results:** The amount of compression was evaluated for magnification imaging (Figure 1a) and spot compression (Figure 1b). For magnification imaging, the slope of the linear regression line (forced through the origin) was 0.82; thus, the breast thickness during magnification imaging was typically 82% of the thickness during Cranial-Caudal (CC) mammography views, or an 18% thickness reduction. For contact spot compression imaging, the slope of the fit (Figure 1b) is 0.92, and an 8% reduction in breast thickness was
achieved on average.

For the cohort evaluated, the average breast thickness in screening and diagnostic mammography was 5.91 cm (σ = 1.13 cm, N = 83). The average breast thickness with tomosynthesis was 6.06 cm (σ = 1.12 cm, N = 64).

Figure 2 illustrates the mean glandular dose as a function of breast thickness for CC views. The results for all procedures – mammography, spot compression, magnification imaging, and tomosynthesis are plotted together (see legend). In this study, most women had a compressed breast thickness (on CC views) between about 5 and 6 cm, with a range of 3 cm to 8.5 cm. Observations from Figure 2 indicate a similar radiation dose from the four procedures, and none are seen to be an outlier, either above or below the best-fit line.

Discussion: The best fit line in Figure 2 is: AGD = 0.84 (mGy) + t (cm) × 0.2501 (mGy/cm), where t is the compressed breast thickness in CC mammography views. Although these results are preliminary given the small number of examinations evaluated, it does appear that, to a first approximation, the dose from any x-ray based imaging procedure of the breast is roughly equivalent when breast thickness is considered. Table 1 allows an estimate of the total dose to the breast from the known breast compressed thickness on CC views and the total number of images acquired during the diagnostic breast examination. The two views from screening mammography can be included in the count when the total dose (screening plus diagnostic exam) is of interest.

Breast density is an important parameter in the computation of MGD of the breast, as tables of DgN values are specific to breast density (3,4,5). Most reference tables present DgN values for breasts with 0%, 50%, and 100% glandular fraction. The DgN values are higher for adipose breasts, however in principle the entrance air kerma would be lower under the usual phototiming conditions. Breast density is not considered in this evaluation, because recent data based upon breast CT evaluation of the breast has indicated that the average breast has a breast density of 12-15% (6), much lower than the typically-assumed 50% breast glandular fraction. Very few women have a volume glandular fraction greater than 50%. Thus, for simplification, a 0% glandular (i.e. 100% adipose) breast composition for DgN values was used for the dose calculations.

The majority of diagnostic breast examinations take place on one breast only, where a suspicious finding exists. Thus, the doses from the diagnostic evaluation are to half of the total breast tissue. In order to estimate effective dose, the glandular dose from all radiographic images from both breasts should be summed (total glandular dose in mGy), and multiplied by 0.12 - the breast tissue weighting factor, wt, which comes from both breasts should be summed (total glandular dose in mGy), and multiplied by 0.12 - the breast tissue weighting factor, wt, which comes from both breasts should be summed (total glandular dose in mGy), and multiplied by 0.12 - the breast tissue weighting factor, wt, which comes from both breasts should be summed (total glandular dose in mGy), and multiplied by 0.12 - the breast tissue weighting factor, wt, which comes from both breasts should be summed (total glandular dose in mGy), and multiplied by 0.12 - the breast tissue weighting factor, wt, which comes from the dose calculations.

The product of MGD and wt becomes the total effective dose, in mSv. For example, a woman with 5 cm thick breasts (CC projection) has conventional two-view mammography on both breasts, is called back, and 4 additional images are acquired on one breast. The woman has 2 views to one breast (4.2 mGy) and 6 views to the other (12.5 mGy). Her average glandular breast dose is ½ (4.2 + 12.5) = 8.35 mGy and her effective dose is 8.35 mGy × 0.12 = 1.0 mSv. By comparison a head CT is about 3 mSv and a body CT is about 8-12 mSv.

Conclusions: The radiation dose to the breast, as characterized using the mean glandular dose (MGD) is approximately the same for common breast imaging examinations including mammography, spot compression, magnification views, and tomosynthesis. Table 1 provides approximate MGD values for patients undergoing multiple diagnostic imaging exams, based upon breast thickness. Although the numbers provided in this table may serve as an approximate guide to the dose levels associated with the diagnostic breast examination, the tabulated values are rough estimates and should not be used to estimate MGD values for a specific woman. The doses estimated herein are also specific to one vendor’s systems, but should not be too different from the doses used by other manufacturers. Breast dose in patients with implants were not considered.

Table 1: The mean glandular dose (MGD) as a function of breast thickness and number of images acquired.

<table>
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Tabular values are Mean Glandular Dose (MGD), in mGy.

Appendix: Technical Methods: The parameters necessary for radiation dose assessment in breast imaging include compressed breast thickness, the approximate glandular fraction, x-ray tube potential (kV), anode material (Mo, W), filter material (Mo, Rh, Al), the entrance air kerma to the breast, and the fraction of the breast exposed to primary radiation (i.e. in magnification views). To compute the air kerma, the tube current- exposure time product (mAs) and corresponding output (mGy/mAs) corrected for distance from the focal spot to the breast are required. The annual physics reports for the three mammography systems were evaluated and the average output (air kerma per mAs at 50 cm) as a function of kV for filters (Mo and Rh) was determined and was computer-fit to a low-order polynomial (Excel, Microsoft Corporation, Redmond, WA). These systems produce both Mo/Mo and Mo/Rh spectra. Lui et al. (1) studied dose in magnification mammography, and found that partial breast irradiation geometry resulted in 92%, 89%, 86%, 83%, 79%, and 75% breast area irradiated for compressed breast thicknesses of 3, 4, 5, 6, 7, or 8 cm, respectively by using the DgN values reported. These factors were used in the dose calculations performed here, along with the inverse square law-corrected entrance kerma. For the tomosynthesis system the estimated MGD reported by the system was used, which is based upon the W/Al anode-filter spectrum (4), and the kV and mAs values.

References
Imaging Informatics and Breast Imaging: A Fellowship Experience

By Dorothy A. Sippo, MD, MPH

Breast imaging is a dynamic multimodality subspecialty, practiced in an interdisciplinary setting that requires tight integration between multiple information systems. The Mammography Quality Standards Act (MQSA) and American College of Radiology (ACR) accreditation require quality assurance programs and medical outcomes audits. Meeting these requirements can involve complex information management challenges. Informatics is, “the study and application of information technology to the arts, science and professions, and to its use in organizations and society at large.” Medical imaging informatics is the branch of this academic field that focuses on medical imaging and information technologies.

When correlating a mammogram with an ultrasound, the During my radiology residency, I became aware of the potential for improvement in the design and implementation of the information systems I was using. I also saw examples of how information technology could be applied to improve workflow within radiology. This led me to seek fellowship training in both breast imaging and imaging informatics. I learned about radiology informatics fellowship opportunities from the Society for Imaging Informatics in Medicine (SIIM), which lists institutions that offer these fellowships. I went on to complete a two-year combined clinical breast imaging and imaging informatics fellowship.

The imaging informatics portion of my fellowship began with public health school coursework which gave me a strong foundation in epidemiology and biostatistics. I acquired data management and analytical skills to evaluate the impact of a variety of computer applications and technologies within breast imaging. During my fellowship, I became familiar with the use of computerized physician order entry (CPOE) with decision support. I worked to add decision support at the time that breast MRI exams were ordered to facilitate ordering the appropriate test and protocol. I was involved with the transition from stand alone workstations to multimodality picture archiving and communication system (PACS) workstations in breast imaging. This transition now allows breast imagers to review mammograms, breast ultrasounds, and breast MRI examinations with a single multimodality workstation, which also has access to all of the patients’ other radiology images.

I gained experience with implementing and optimizing systems for critical results reporting and communications tracking. This system is integrated with the PACS and allows breast imagers to electronically inform referring physicians of a biopsy recommendation or other critical findings. This system electronically documents that communication. I was also involved with an initiative to streamline the breast imaging second opinion consultation service. One of the goals of this effort was to improve the management of outside digital images being imported into our institution’s PACS.

I learned to query clinical data repositories to answer both research and quality assurance questions to improve patient care and efficiency. Natural language processing (NLP) was used to automatically obtain meaningful information from the free text in radiology and pathology reports. Working with another radiologist imaging informatics fellow, we developed a NLP algorithm that extracts the Breast Imaging Reporting and Data System (BI-RADS®) final assessment categories from the free text of any breast imaging report. The standardized BI-RADS® lexicon facilitates NLP’s automated information extraction from the free text of breast imaging reports. I also helped to evaluate the use of standardized templates for structured reporting of breast MRI examinations and its impact on consistent report content.

These projects are examples of the vast role of informatics in breast imaging. What I have found most useful about the informatics portion of my fellowship is that it has provided me with a systematic approach to evaluate and facilitate the use of information systems and technology in breast imaging. Workflow analysis and a clear implementation strategy are equally as important as the actual capability of a particular technology solution. Now that I have completed my fellowship, I am working with the breast imaging section head, the radiology clinical informatics architect, and a team of technologists, information systems and radiology managers to select and transition to a new mammography information system. This project requires us to thoroughly understand our current workflow, the functionality of the proposed vendor solutions and required information system integrations. My informatics fellowship has prepared me to contribute to these efforts. I would encourage breast imagers to explore imaging informatics further through the SIIM website and presentations focused on informatics at professional meetings, such as the annual Radiological Society of North America (RSNA) meeting.

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