Advanced Breast Imaging Availability by Screening Facility Characteristics

Christoph I. Lee, MD, MSHS, Andy Bogart, MS, Rebecca A. Hubbard, PhD, Eniola T. Obadina, MD, Deirdre A. Hill, PhD, Jennifer S. Haas, MD, MSPH, Anna N. A. Tosteson, ScD, Jennifer A. Alford-Teaster, MA, MPH, Brian L. Sprague, PhD, Wendy B. DeMartini, MD, Constance D. Lehman, MD, PhD, Tracy L. Onega, PhD

Rationale and Objectives: To determine the relationship between screening mammography facility characteristics and on-site availability of advanced breast imaging services required for supplemental screening and the diagnostic evaluation of abnormal screening findings.

Materials and Methods: We analyzed data from all active imaging facilities across six regional registries of the National Cancer Institute–funded Breast Cancer Surveillance Consortium offering screening mammography in calendar years 2011–2012 ($n = 105$). We used generalized estimating equations regression models to identify associations between facility characteristics (eg, academic affiliation, practice type) and availability of on-site advanced breast imaging (eg, ultrasound [US], magnetic resonance imaging [MRI]) and image-guided biopsy services.

Results: Breast MRI was not available at any nonradiology or breast imaging–only facilities. A combination of breast US, breast MRI, and imaging-guided breast biopsy services was available at 76.0% of multispecialty breast centers compared to 22.2% of full diagnostic radiology practices ($P = .0047$) and 75.0% of facilities with academic affiliations compared to 29.0% of those without academic affiliations ($P = .04$). Both supplemental screening breast US and screening breast MRI were available at 28.0% of multispecialty breast centers compared to 4.7% of full diagnostic radiology practices ($P < .01$) and 25.0% of academic facilities compared to 8.5% of nonacademic facilities ($P = .02$).

Conclusions: Screening facility characteristics are strongly associated with the availability of on-site advanced breast imaging and image-guided biopsy service. Therefore, the type of imaging facility a woman attends for screening may have important implications on her timely access to supplemental screening and diagnostic breast imaging services.

Key Words: Screening; breast cancer; mammography; diagnostic imaging.

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From the Department of Radiology, University of Washington School of Medicine, 825 Eastlake Ave East, Seattle, WA 98109 (C.I.L., E.T.O., C.D.L.); Department of Health Services, University of Washington School of Public Health, Seattle, Washington (C.I.L.); Group Health Research Institute, Seattle, Washington (A.B., R.A.H.); Department of Internal Medicine, Cancer Research and Treatment Center, University of New Mexico, Albuquerque, New Mexico (D.A.H.); Division of General Internal Medicine and Primary Care, Brigham and Women's Hospital, Boston, Massachusetts (J.S.H.); Department of Medicine, Harvard Medical School, Dana Farber Harvard Cancer Institute, Boston, Massachusetts (J.S.H.); Department of Social and Behavioral Sciences, Harvard School of Public Health, Boston, Massachusetts (J.S.H.); Departments of Medicine (A.N.A.T., J.A.A.-T., T.L.O.) and Community and Family Medicine (J.A.A.-T., T.L.O), Dartmouth Institute for Health Policy and Clinical Practice, Norris Cotton Cancer Center, Geisel School of Medicine, Lebanon, New Hampshire; Department of Surgery and Office of Health Promotion Research, University of Vermont, Burlington, Vermont (B.L.S.); and Department of Radiology, University of Wisconsin School of Medicine and Public Health, Madison, Wisconsin (W.B.D.). Received November 6, 2014; accepted February 13, 2015. Funding Sources: This work was supported by grants from the National Cancer Institute (RC2CA148577 and P01CA154292 and, for the Breast Cancer Surveillance Consortium, HHSN261201100031C) and the American Cancer Society (MRSG-14-160-01-CPHPS). The design and conduct of the study; collection, management, analysis, and interpretation of the data; preparation, review, or approval of the manuscript; and decision to submit the manuscript for publication are solely the responsibility of the authors and do not necessarily represent the official views of the funding agencies. **Address correspondence to:** C.I.L. e-mail: stophlee@uw.edu

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Inherent health system attributes, such as place of service, strongly influence both access to and quality of health care in the United States (1–4). For women undergoing routine breast cancer screening in the United States, both access to and quality of breast imaging services vary widely (5–9). For women with an abnormal screening result, timely and complete diagnostic imaging evaluation is a critical, intermediate step between screen-detected malignancy and definitive treatment (10,11). Appropriate diagnostic breast imaging frequently requires modalities beyond mammography, including diagnostic breast ultrasound (US), image-guided breast biopsy, and breast magnetic resonance imaging (MRI; eg, for extent of disease and surgical planning) (12). Patient access to and ready availability of these advanced breast imaging modalities, therefore, may play an important role in preventing delays in diagnostic evaluation and, potentially, worse patient outcomes (13,14).

Over the last decade, technologic advances in breast imaging modalities, including higher resolution breast US and breast MRI, along with expansion of their clinical indications, have caused the rapid diffusion of these technologies into community practices (15). However, the diffusion and adoption of these advanced imaging modalities may not occur based on patient need, including high lifetime breast cancer risk (16). Moreover, the demand for more advanced breast

imaging is likely to increase with new breast density reporting laws enacted by states across the United States (17). These laws mandate that imaging facilities inform women with mammographically dense breasts that they are at increased risk of developing cancer and some also require notification that they may benefit from supplemental screening (18). For women at increased risk of developing cancer, both screening breast US and screening MRI have been found to increase cancer detection beyond mammography alone, and annual screening breast MRI is a cost-effective measure among women at very high breast cancer risk (19,20). Utilization of breast MRI is also increasing among women with a personal history of breast cancer for routine surveillance (16).

Thus, for both women who seek an imaging facility that can provide diagnostic breast imaging or biopsy on-site if a screening abnormality is detected and women who seek supplemental screening beyond mammography, it would be helpful to know what types of imaging facilities are more likely to offer advanced breast imaging services. Our study objective was to describe the current advanced breast imaging availability at U.S. community-based imaging facilities based on their characteristics, including for-profit status, academic affiliation, and practice type. Specifically, we aimed to determine the relationship between facility-level characteristics and the availability of breast US, breast MRI, and image-guided breast biopsies, alone and in combination, among a national sample of U.S. community imaging facilities that offer screening mammography.

MATERIALS AND METHODS

Study Population

We obtained data from a large cohort of active imaging facilities that are included in the National Cancer Institute–funded Breast Cancer Surveillance Consortium (BCSC) a collaborative network of mammography registries that represent the largest national database regarding breast cancer screening (http://breastscreening.cancer.gov). The population served by the BCSC has been shown to be comparable to the U.S. population (5,21). We analyzed pooled data sent to the BCSC Statistical Coordinating Center (SCC) during calendar years 2011 and 2012, from six registries (New Hampshire, North Carolina, San Francisco, Vermont, Chicago, and Western Washington). Each registry and the SCC received institutional review board approval for either active or passive consenting processes or a waiver of consent to enroll individual facilities, link data, and perform analytic studies. All procedures were Health Insurance Portability and Accountability Act compliant, and each registry and the SCC received federal certificates of confidentiality and other protections for the identities of individual community facilities.

Data Collection

Each of the six registries obtained data from their respective BCSC-affiliated imaging facilities that offer screening mammography. Individual fixed-location facilities self-reported their data on the availability of advanced breast imaging modalities beyond mammography and image-guided breast biopsy services for calendar years 2011–2012. Imaging data included the availability of breast US (for screening and any indication), breast MRI (for screening and any indication), stereotactic core breast biopsy, US-guided core breast biopsy, and MRI-guided core breast biopsy.

Individual facilities reported their academic medical center affiliation (if any), their for-profit versus not-for-profit status, and their practice type. For practice type, we categorized each stand-alone facility as a nonradiology practice, breast imaging–only practice, full diagnostic radiology practice, or a multispecialty breast center. Each facility was asked to select a single practice type that best described them. We defined a nonradiology practice as an imaging facility located within and operated by a different specialty (eg, obstetrics and gynecology clinic). We defined a breast imaging–only practice as a facility that only offers imaging services specific to the breasts and no other anatomic body part. We defined a full diagnostic radiology practice as one that offers imaging services for multiple anatomic body parts beyond the breasts. Finally, we considered a multispecialty breast center to be a facility that is part of an integrated care center with on-site breast-specific specialists in addition to radiologists (eg, a cancer center with on-site breast oncologists, breast radiation oncologists, and breast pathologists).

Statistical Analysis

We performed statistical analyses using SAS version 9.3 (SAS Institute, Cary, NC) and Stata version 12 (Statacorp LP, College Station, TX). We tabulated the distribution of facility characteristics (for-profit status, academic affiliation, and practice type). We then used generalized estimating equations (GEE) to calculate the proportion of facilities of each profit status, academic affiliation, and practice type that provided advanced breast imaging services. Specifically, we examined the availability of breast US (for screening or any indication), breast MRI (for screening or any indication), image-guided breast biopsy (stereotactic, US guided, MRI guided, and any imaging guided), and combinations of advanced breast imaging and image-guided breast biopsy services by facility characteristics. Each model regressed a binary indicator of service provision on dummy variables for the facility characteristic of interest. Our GEE models accommodated correlation among individual fixed-location facilities belonging to the same imaging group practice (eg, multiple fixed-location facilities affiliated with one another and/or under the same management) through the use of the robust Huber-White (sandwich) variance estimator (22). We obtained predicted probabilities from each model and estimated 95% confidence bounds around each probability estimate via the delta method. Confidence bounds were not calculated for probability estimates of exactly 0 or 1. We report P values based on the joint Wald test of model parameters associated with the facility characteristic of interest,