Patterns of Breast Magnetic Resonance Imaging Use
An Opportunity for Data-Driven Resource Allocation

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Both the American Cancer Society\(^1\) and the National Comprehensive Cancer Network\(^2\) have published guidelines on the recommended use of breast magnetic resonance imaging (MRI). In both sets of guidelines, lifetime breast cancer risk greater than 20% has been established as an acceptable threshold for annual MRI screening when used together with annual mammography screening. Routine breast MRI screening is not recommended for a new cancer diagnosis or for cancer surveillance.

Nevertheless, MRI remains frequently used for these other indications. A systematic review of the accuracy of MRI and its impact on surgical treatment of breast cancer showed that the use of MRI for surgical treatment planning is widespread, although its benefit remains difficult to demonstrate.\(^3\) For evaluation of the contralateral breast in patients with a new diagnosis of breast cancer, the American College of Radiology Imaging Network (ACRIN) 6667 trial found that the contralateral breast cancer detection rate with breast MRI was 3.1%, indicating possible utility in this setting.\(^4\) Recent studies have also indicated value for breast MRI in neoadjuvant treatment where breast MRI may have clinical utility both in treatment planning and as a prognostic marker.\(^5\) As yet, however, the impact of MRI on clinical management has not been linked to improvements in breast cancer outcomes.

Cost Considerations of Breast MRI

In an era of ever-increasing focus on cost containment in health care, the value of MRI is clearly an issue of concern. In 2013, the Centers for Medicare & Medicaid Services reimbursement for a digital bilateral diagnostic mammogram performed in an imaging center is approximately $300 per examination. In comparison, the fee schedule for bilateral breast MRI with contrast including technical and professional components ranges from $880 to $1637, adjusted by geographic practice cost index.\(^6\) It has been estimated that up to 6 million women may meet guidelines for breast MRI screening; if even one-third of these women are screened with MRI, this will result in more than $2 billion of additional expenditures annually for breast cancer screening alone.

Consideration of cost must also include the unintended consequences of those who undergo breast MRI, including additional biopsies, increased anxiety, and additional follow-up examinations. The increased sensitivity of breast MRI is achieved at the cost of lower specificity compared with mammography. In the largest study to date, the specificity of screening mammography and MRI in a high-risk population were 95% and 90%, respectively.\(^7\) In practice, this translates into more biopsies needed to rule out cancer.

Patterns of Breast MRI Use

In this context, the studies by Wernli et al\(^8\) and Stout et al\(^9\) illustrate how groups of providers, largely community based, have used breast MRI in the past decade. The studies were conducted in 2 different patient populations using differing methodology; nevertheless, the findings are remarkably consistent. Wernli and colleagues\(^6\) collected data from 5 geographically dispersed Breast Cancer Surveillance Consortium Registries from 2005 through 2009. The investigators found that the use of breast MRI increased from 4.2 per 1000 to 11.5 per 1000 women during that period, with 32% of the breast MRIs ordered for screening, 40% for diagnostic evaluation, and 16% for workup of new cancers. In the study by Stout et al,\(^9\) pooled insurance claim data from 2 nonprofit health care systems in 3 New England states demonstrated a 16-fold increase in the breast MRI use rate from 2000 through 2011. Although initially the majority of breast MRIs were performed for diagnostic indications, by 2011 the most common use of breast MRI was for screening (31% of studies performed). In both studies, the use of breast MRI increased for screening and decreased for diagnostic evaluation. Both studies reported a plateau in breast MRI ordering after 2008.

The Need for Reallocation of Breast MRI Resources

What is striking in both the studies by Wernli et al\(^8\) and Stout et al\(^9\) was that breast MRI was both overused in women not meeting guideline criteria and underused in those who could derive greatest benefit. For instance, in the study by Wernli et al,\(^8\) the Breast Cancer Risk Assessment Tool (http://www.cancer.gov/bcrisktool/) was used to calculate lifetime breast cancer risk on the basis of patient-reported data. They found that fewer than 5% of the women who had a greater than 20% risk were screened with breast MRI. Furthermore, among those who were screened with MRI, only 25% were in the greater than 20% risk category. These data clearly indicate the need for better patient selection for breast MRI screening if breast MRI is to be maximally effective.

In this regard, the expanding use of health information technology for medical care offers an important opportunity. The Health Information Technology for Economic and Clinical Health Act was enacted in 2009 to promote the use of health information technology to improve the provision of health care. Under this legislation, health care providers meeting “meaningful use” criteria are eligible to receive bonus incentive payments by demonstrating implementation and use of electronic health records in providing health care. Crucial to achieving this goal is accurate real-time collection of electronic data. Increasingly sophisticated electronic clinical tools will help in this process—1 example among several is the Hughes...
riskApps (http://www.hughesriskapps.com), a web-based tool that allows calculation of lifetime breast cancer risk at point of care based on several validated cancer risk models (Figure). Incorporation of such tools into screening decisions is a critical step toward a more “personalized cancer screening” model in which recommendations are based on individual cancer risk assessment.

Both the studies by Wernli et al8 and Stout et al9 also show that breast MRI continues to be used outside the screening context in areas such as staging of new breast cancers and post-treatment surveillance where there exist insufficient data to support its use. Research efforts are needed in these areas to determine best use of breast MRI for diagnosis, evaluation, treatment, and surveillance. To that end, the multicenter prospective study Alliance A11104/ACRIN 6694 (Effect of Preoperative Breast MRI on Surgical Outcomes, Costs and Quality of Life of Women with Breast Cancer) will help to identify the value of breast MRI for patients with newly diagnosed cancers. A thoughtful data-driven allocation of technology is necessary for clinicians and patients to make the best choices. As a medical community, we bear a collective responsibility to ensure that breast MRI provides sufficient clinical benefit to warrant the additional biopsies, increased patient anxiety, and cost that accrue with its use.

Hughes riskApps (http://www.hughesriskapps.com) is a web-based tool that allows calculation of lifetime breast cancer risk at point of care based on BRCAPRO, Tyrer-Cuzick, Myriad, Claus, and Gail models. The tool incorporates 2 screens for patient self-reported data entry: A, family history screen; B, personal risk factor screen. The tool has been implemented as part of breast cancer screening programs, with referring health care providers given an individual patient’s lifetime breast cancer risk assessment, as well as recommendations for breast cancer screening. Published with permission from Hughes riskApps.
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Published Online: November 18, 2013. doi:10.1001/jamainternmed.2013.10502.

Conflict of Interest Disclosures: None reported.

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