Screening for Early Detection of Breast Cancer: Overdiagnosis versus Suboptimal Patient Management[1]

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Despite a large number of studies demonstrating the benefits of screening mammography in the early detection of breast cancer, the practice remains highly controversial, primarily because of the lack of reliable long-term data for direct comparison of the nonscreening population with patients randomly assigned to undergo screening with current advanced technology. This is particularly true when assessing the effect of the introduction of newer technologies (eg, full-field digital mammography, automated or hand-held whole-breast ultrasonography, digital breast tomosynthesis, etc) and modified practices (eg, same-day service, use of computer-aided detection, double reading, provision of Mammography Quality Standards Act data to radiologists, etc) for this purpose.

As a result, proponents primarily point to observational studies of various types and opponents point to indirect measures of effectiveness or the lack thereof. A recent New England Journal of Medicine article highlighted an interesting and potentially important argument regarding the effect of screening mammography (1). Bleyer and Welch concluded that over a long period of time, the estimated adjusted number of late-stage cancers, which can be considered "killer" cancers for the purpose of our article, detected with screening has decreased only marginally (approximately 8%), despite aggressive screening practices in the United States, while mortality from breast cancer has been reduced substantially (approximately 28%) (1).

The term *overdiagnosis* is often used in population-based studies to describe the difference between cancer detection and subsequent treatment of abnormal findings and the actual corresponding population-based effect on mortality. The percentage of overdiagnosis represents the estimated or computed percentage of cases that were detected and treated but that would not have affected mortality if they had been left alone. By using a model for expectation values, Bleyer and Welch (1) estimated that 31% of diagnosed breast cancers in the population are likely to represent overdiagnosis. Hence, the authors attribute most of the success in terms of reduced mortality of breast cancer in the past few decades to improvements in treatment rather than to improvements in earlier detection. This is an important argument and should be investigated more carefully, as Bleyer and Welch point to various limitations of their own study, including but not limited to the estimated input parameters in the model. This commentary addresses the topic of overdiagnosis from a different imaging-based perspective.

Perhaps it is unfortunate that medicine is primarily focused on the objectives of "look more," "detect more and earlier," and, as a result, "treat more." While Bleyer and Welch do not directly discuss these objectives, they seem to suggest that overdiagnosis as conventionally used in epidemiology or population-based studies is the primary issue at hand. Namely, as investigators seek to develop and implement technologies and practices that result in the detection of more abnormalities at an earlier stage of development, perhaps many of these abnormalities should not even be considered preclinical disease because they may not actually affect patient life expectancy or they may never have been detected had the screening practice not existed. The position of those who have to make management decisions about these abnormal findings (whether in consultation with radiologists or not) suggests that radiologists need not look as hard to find these preclinical abnormalities and that doing so would, for all practical purposes, reduce, if not eliminate, the problem of overdiagnosis.

In the modern information society in which we live, one has to accept the fact that good and correct information is always good. What is not always good is the way this information is used when making optimal management decisions. Subopti-

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mal use or misuse of correct information through information overloading and/or the introduction of noise that does not carry additional diagnostic information is primarily a human factor that can and should eventually be overcome by professionals. Once a decision to screen is made, the role of radiology in screening for early detection of disease has been and needs to remain diligence in detecting and correctly diagnosing all depicted abnormalities at the earliest stage possible. What follows is the role of other specialties, preferably with appropriate and valuable input from radiologists as active participants, in deciding how best to use the provided information.

In our opinion, there is no such thing as overdiagnosis, there is only correct, partially correct, or incorrect diagnosis. If abnormal findings are diagnosed correctly, there is only optimally managed, suboptimally managed, mismanaged, and possibly overtreated disease. Society as a whole, together with everyone involved in making these clinical management decisions, including radiologists, has to determine and agree on the most effective and efficacious management path. If some of the findings are not considered indicative of a clinically important disease or are indicative of a disease that is better left alone at the time of diagnosis, it is reasonable and should be acceptable to leave the disease alone, as long as the information provided by radiologists is accurate and complete. Eventually, this approach may very well result in decisions not to treat the disease but rather to follow specific reported findings until and unless there is a change in these findings over time that necessitates treatment, as highlighted by Bleyer and Welch (eg, grade 1 ductal carcinoma in situ). Radiologists should be encouraged by all to look more and find more, as this work is at the core of generating accurate and complete descriptions of abnormal findings in patients and would hopefully constitute valuable information. Radiologists should not intentionally hide in the sand to avoid finding some abnormalities, despite the concerns expressed by our colleagues about additional findings that required additional biopsies or surgical interventions for largely benign disease. Radiologists should always focus on finding all abnormalities and classifying them correctly, and they should encourage appropriate management rather than not look and thereby not find!

In other areas of radiology (eg, bones and chest) there are well-recognized "leave-me-alone" lesions. While there are some abnormalities of this type in breast imaging, the problem is that there are perhaps some lesions for which the information needed to optimally guide appropriate management does not exist. To our knowledge, there are currently no accepted criteria or guidelines for many types of abnormalities depicted in the breast to determine which detected abnormality may indeed constitute an overdiagnosis, a population-based term, when applied to findings within an individual examination. The current controversy surrounding the treatment of lobular neoplasia is but one example. At the same time, whenever possible, radiologists should be active participants in management decisions or, at a minimum, be active consultants to those who make them. We should strive to be at the table whenever possible, as we cannot fully blame our colleagues for suboptimal use of information we provide if we are not actively trying to be participants in this process.

How much looking radiology can afford, is expected, or perhaps is even directed to do will eventually be determined by policymakers, as the cost of imaging-based screening of large populations is substantial. However, radiologists should never shy away from finding and correctly characterizing as much as possible as early as possible. There should not be any doubt that the overall objective of a screening program is to first and foremost detect, correctly diagnose, and appropriately treat early preclinical cancers that, if left alone, would become life-threatening cancers. Interestingly, all recently proposed imaging approaches to screening (either primary or supplemental screening) attempt to at least partially address this issue, namely, improving detection and diagnosis of invasive node-negative and node-positive nonmetastasized cancers (2,3). A second major objective should be to identify women at higher than average risk for developing these cancers and to develop an appropriate and hopefully optimal personalized management plan for them. This includes all risk factors, such as personal history, genetic disposition, breast density and the like, as well as depicted abnormality–related risk factors (eg, calcification clusters and asymmetry). Because none of the currently available technologies are perfect in this regard and because future approaches, such as cellular, molecular, and/or genetic profiling, are not likely to be perfect either, we are bound to do whatever we can to progress toward achieving these objectives as best we can. Eventually, under a truly optimal individualized health care delivery system, some, if not many, of the imaging-based findings will become important as risk factors or modifiers for future follow-up protocols.

Most importantly, we must ensure that overtreatment rather than so-called overdiagnosis is addressed by medicine and society as a whole. Until there are validated and accepted alternatives to imaging-based screening, as imagers finding these lesions, we are doing exactly what we are supposed to do and exactly what women expect us to do.

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