The Benefits and Harms of Mammography Screening: Understanding the Trade-offs

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Understanding the Trade-offs

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INTUITIVELY, CANCER SCREENING MAKES GOOD SENSE—find cancers early and treat them before they become dangerous. The intensely negative response to the US Preventive Services Task Force (USPSTF) recommendations about mammography,[1] that women with their physicians might decide to screen later or less often, is not very surprising.

For years, physicians and patients have received a simple message about cancer screening, "Take the test not the chance." The media, celebrities, politicians, advocacy groups, physician report cards (eg, HEDIS—Healthcare Effectiveness Data and Information Set), even US Postal Service stamps reinforce this message. And the public has embraced it. In a national survey of 500 US adults, 87% said they thought screening was almost always a good idea and most indicated they would overrule a physician who recommended against screening.[2] Enthusiasm was so strong that for many individuals, screening was not a decision but a moral imperative; one-third thought an 80-year-old who chose not to have a Papanicolaou test, mammogram, prostate-specific antigen screening, or colonoscopy was irresponsible.

However screening is not simply about benefit, it also causes important harms. To make good decisions about screening, patients should understand the trade-offs[3] (TABLE).

What is the magnitude of the benefit? It is estimated that without screening, 3.5 of 1000 women in their 40s will die of breast cancer over the next 10 years (ie, 996.5 of 1000 will not die of the disease).[4] Screening reduces the chance of breast cancer death from 3.5 to about 3 of 1000.[4] For most women with cancer, screening generally does not change the ultimate outcome; the cancer usually is just as treatable or just as deadly regardless of screening.[5]

The benefit of screening must be weighed against its harms. The discussion of harm has largely focused on false-positive screening tests. In one survey, 40% of women (n=109) who had a false-positive mammogram result described the experience as "very scary" or "the scariest time of my life."[2] Fortunately, such experiences are temporary. In retrospect, almost all women who received false-positive mammogram results said they were glad they had undergone the test. In another survey of 479 US women, more than one-third reported they would tolerate more than 10 000 false-positive mammograms for every breast cancer death avoided.[6]

False-positive test results are not the most important harm of screening—overdiagnosis is (ie, cancers detected by mammography that were never destined to cause symptoms or result in death). Because it is not possible to know which women are overdiagnosed, all are treated with surgery, chemotherapy, radiation, or some combination.[5] Overdiagnosed women are unnecessarily diagnosed, undergo treatment that can only cause harm, and must live with the ongoing fear of cancer recurrence.

The discussion of overdiagnosis is often met with disbelief. In a previous survey,[6] only 7% of women believed there could be breast cancers that grow so slowly that even without treatment a woman's health would not be affected. The best evidence for overdiagnosis comes from the same randomized trials that demonstrated the benefit of mammography. Because women in the trials were randomly assigned to receive screening, the number of breast cancers that develop over time should be the same in each group. Initially, the number of women diagnosed with breast cancer should be higher in the mammography group because mammograms find tumors too small to be detected otherwise. Over time, the nonscreening group should catch up as the small tumors grow and become detectable. However, in the clinical trials, breast cancer diagnosis in the screened group remained persistently higher even after many years. This persistent difference represents overdiagnosis. Estimates of the rate of overdiagnosis vary. Based on 15-year follow-up of the Malmo trial,[7] 2 women are overdiagnosed for every breast cancer death avoided. Gøtzsche et al[8] estimated this ratio to be 10 to 1.

Different women will interpret the benefits and harms of screening differently. For some women aged 40 to 49 years, the benefit of screening will seem worth the chance of false-positive results or overdiagnosis. For others, the harms will

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Table. Summary of Benefits and Harms of Screening[a]

	Risks by Age, y	
	40-49	50-59
Benefit[4]		
Reduced 10-y chance of dying from breast cancer		
No screening	3.5/1000	5.3/1000
Screening	3.0/1000	4.6/1000
Avoid breast cancer death because of screening	0.5/1000	0.7/1000
Harms of screening		
False-positive screening test requiring a biopsy[4,10]	60-200/1000	50-200/1000
Overdiagnosis—unnecessary diagnosis and treatment (surgery, chemotherapy, or radiation) for breast cancer[7,8]	1-5/1000	1-7/1000

[a] The numbers are approximations based on average-risk women, and assume screening every 1 or 2 years for 10 years. The benefit is based on the task force's number needed to treat and relative risk reductions. The overdiagnosis numbers apply the ratios of 2 and 10 women overdiagnosed for 1 breast cancer death avoided.[7,8] A similar version of this table was published following earlier guidelines on mammography screening.[3]

seem too great, which is exactly the point. Each woman, with the help of her physician, needs to consider these harms and benefits and decide whether to undergo screening.

The benefits and harms of screening vary with age (Table). The USPSTF concluded that benefit outweighs harm for women aged 50 to 74 years, but not for women younger than age 50 years. While clinicians, women, and others may disagree with the USPSTF recommendations, they can only make meaningful decisions if they have the relevant information.

Some important lessons can be drawn from the mammography debate—lessons that will apply any time less screening is suggested. For such suggestions to make sense, however, people need balanced information. Simplistic slogans touting only the benefit are deceptive. Simple, standardized summaries (Table) about the benefits and harms of testing would help foster good decision making.

To be open to balanced information, the public needs to reframe its thinking about medical care. It is important for the public to remember that the goal of medicine is to help patients live healthier longer lives. Sometimes more testing helps to reach the goal, but other times less testing does. Suggestions to do less may be as much in an individual's interest as suggestions to do more.

Finally, the politicalization of medical care is wrong. Promoting screening irrespective of the evidence may garner votes but will not create healthier voters. It may do the opposite. For instance, in response to the USPSTF recommendation, the US Senate passed an amendment to require insurers to provide free preventive services for women including screenings not only for breast cancer, but also for ovarian, lung, and other cancers.[9] However, even the American Cancer Society does not recommend either ovarian or lung cancer screening because screening tests for both diseases lack evidence of benefit and can cause substantial harm.

Medical decision making about cancer screening is difficult. Some interventions help, but there are always tradeoffs. It is essential to remember that the harms are just as real as the benefits.

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REFERENCES

1. US Preventive Services Task Force. Screening for breast cancer: US Preventive Services Task Force recommendation statement. *Ann Intern Med*. 2009;151(10):716-726.
2. Schwartz LM, Woloshin S, Fowler F Jr, Welch H. Enthusiasm for cancer screening in the United States. *JAMA*. 2004;291(1):71-78.
3. Schwartz LM, Woloshin S. Participation in mammography screening. *BMJ*. 2007;335(7623):731-732.
4. Mandelblatt JS, Cronin K, Bailey S, et al; Breast Cancer Working Group of the Cancer Intervention and Surveillance Modeling Network. Effects of mammography screening under different screening schedules: model estimates of potential benefits and harms. *Ann Intern Med*. 2009;151(10):738-747.
5. Esserman L, Shieh Y, Thompson I. Rethinking screening for breast cancer and prostate cancer. *JAMA*. 2009;302(15):1685-1692.
6. Schwartz LM, Woloshin S, Sox HC, Fischhoff B, Welch HG. US women's attitudes to false positive mammography results and detection of ductal carcinoma in situ: cross sectional survey. *BMJ*. 2000;320(7250):1635-1640.
7. Zackrisson S, Andersson I, Janzon L, Manjer J, Garne J. Rate of over-diagnosis of breast cancer 15 years after end of Malmo mammographic screening trial: follow-up study. *BMJ*. 2006;332(7543):689-692.
8. Gøtzsche PC, Nielsen M. Screening for breast cancer with mammography. *Cochrane Database Syst Rev*. 2009;(4):CD001877.
9. Pear R, Herszenhorn DM. Senate backs preventive health care for women. *The New York Times*. December 3, 2009.
10. Elmore JG, Barton M, Moceri V, Polk S, Arena P, Fletcher S. Ten-year risk of false positive screening mammograms and clinical breast examinations. *N Engl J Med*. 1998;338(16):1089-1096.