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Evidence Summary Title:

Screening for breast cancer: Evidence and implications for public health

Review Quality Rating: 10 (strong)

Review on which this evidence summary is based:
Nelson, H.D., Tyne, K., Naik, A., Bougatsos, C., Chan, B.K., Chan, M.S., Humphrey, L. (2009). **Screening for breast cancer: An update for the U.S. Preventive Services Task Force**. *Annals of Internal Medicine, 151,* 727 - 737.

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This is an evidence summary written to condense the work of the authors of this systematic review, referenced above. The intent of this summary is to provide an overview of the findings and implications of the full review. For more information on individual studies included in the review, please see the review itself.

Review content summary

This overview aimed to update the 2002 USPSTF recommendations. The overview aims to determine the effectiveness of mammography screening in decreasing breast cancer mortality among average-risk women aged 40 to 49 years (8 studies; n = 348 219) and 70 years or older (1 study); along with the decrease in mortality of women of any age through use of clinical breast examination (CBE) and breast self-examination (BSE) (5 studies). Participants studied were women between the ages of 31 to 74 years. To be included, studies had to be randomized controlled trials or updates of previous trials of mammography screening, MRI, CBE, or BSE with breast cancer mortality outcomes published since 2001. Systematic reviews were also eligible for inclusion. Outcomes measured included: breast cancer incidence/mortality, the rate of false-positives, and the frequency of benign biopsies. Authors report that mammography appears to be effective for women aged 39 to 69 years, but false positive rates and additional imaging occur regularly. Data for women aged 70 years and older, however, were insufficient. The benefits of BSE or CBE have not been demonstrated, though trials on CBE are ongoing.

Comments on this review's methodology

This is a methodologically strong systematic review. A focused clinical question was clearly identified, and appropriate inclusion criteria were used to guide the search. A comprehensive search was employed using health databases, reference lists were consulted and experts were contacted. The search was not limited by language. Primary studies were assessed for methodological quality using the following criteria: research design, extent of loss to follow-up, maintenance of comparable control and intervention groups, use of allocation concealment, and data collection and analysis. Only those studies with "fair" or "good" quality were included in the meta-analysis. The methods were described in sufficient detail to allow replication. Two independent reviewers were involved in quality appraisal, and any discrepancies in appraisal results were resolved through discussion. The results of this review were transparent. Results were clearly presented in graphical form, and in the text, to allow for comparisons across studies. Heterogeneity was assessed. Appropriate analytical methods (i.e. random effects model) were employed to enable the synthesis of study results, and a narrative synthesis was undertaken if statistical synthesis was not appropriate.

Why this issue is of interest to public health

Breast cancer is the most common cancer in Canadian women (other than non-melanoma skin cancer), and is the second-leading cause of cancer deaths.[1, 2] It is expected that one in nine Canadian women will develop breast cancer during her lifetime.[2, 3] The Canadian Cancer Society's estimates that *23,200* Canadian women will diagnosed with breast cancer in 2010, while *5,300* will die of it.[2] In Canada, more than 97% of breast cancers found by organized screening programs are at an early stage, which improves the chance of survival.[3, 4] In some cases, mammography detects cancers that would not be felt for another 2 to 4 years.[3] Mammography is the most common secondary prevention method, and is still considered the most efficacious screening tool for breast cancer, *especially* for women between the ages of 50 – 69.[3, 5, 6] Ensuring the accuracy of screening procedures is essential, as technology associated with a large number of false positives may generate psychological stress for women, unnecessary interventions, and increase the cost of individual patient care.[4]

Evidence and implications

Evidence points are not in order of the strength of evidence.

What's the evidence?	Implications for practice and policy:
1. Breast cancer screening with mammography and mortality (8 studies) 1.1. In 8 studies, mammography screening reduced breast cancer mortality by 15% among women 39 to 49 years of age 1.1.1. The true risk ranged from 25% less likely to 4% less likely to die from breast cancer (RR 0.85, 95% CI 0.75 – 0.96). 1.1.2. This corresponds to 1904 invitations to screening needed to prevent 1 breast cancer death (NNI 1904, 95%CI 929 – 6378). 1.1.3. Women were followed up from 11 to 20 years in the 8 studies. 1.1.4. These results compare to a reduced breast cancer mortality risk of 14% for women 50 – 59 years of age (RR 0.86, 95% CI 0.75 – 0.99); and 32% for women 60 – 69 years of age (RR 0.68, 95% CI 0.54 – 0.87). 1.2. In one study of women 70 years and older, mammography screening did not reduce breast cancer mortality 1.2.1. The true risk ranged from 27% less likely to 72% more likely to die from breast cancer (RR 1.12, 95% CI 0.73 – 1.72).	**1. Breast cancer screening with mammography and mortality** 1.1. Women aged 39-49 at average risk of breast cancer may benefit from mammography screening to reduce the risk of death from breast cancer. 1.2. Mammography should be recommended to women 50 – 69 years of age to reduce breast cancer mortality. 1.3. Among women 70 years and older, mammography is not recommended to reduce breast cancer mortality.
2. Harms of mammography screening 2.1. Exposure to radiation as a result of mammography does not present a significant risk for breast cancer 2.1.1. In one study, radiation exposure as a result of mammography screening measured approximately 60mGy over 10 years. 2.2. Harms, including pain, anxiety, distress and other psychological responses are common among women who receive mammography screening. 2.3. False-positive results are common among women who receive mammography screening 2.3.1. Several studies and one meta-analysis estimate the probability of false-positive screening results ranging from 0.09% 56% 2.3.2. Risk of false-positive screening results are highest among women 40 – 49 years of age. 2.4. Over-diagnoses are common among women who receive mammography screening 2.4.1. Estimates of rates of over-diagnoses differ, with most between 1% to 10%.	**2. Harms of mammography screening.** 2.1. Women should be informed of potential harms and risks of mammography screening, including pain, anxiety, other psychological responses, risk of false-positive results (including additional imaging and biopsies) and over-diagnosis 2.1.1. Women 40 – 49 years of age should be informed that false-positive screening results are highest in this age group.
3. Clinical Breast Examination (CBE) 3.1. In 3 studies, no benefit was found for CBE in reducing breast cancer mortality risk 3.1.1. These studies were conducted in the Philippines, Egypt and India.	**3. Clinical Breast Examination (CBE)** 3.1. Data are insufficient to recommend CBE.
4. Breast Self-examination (BSE) 4.1. In 2 studies, no benefit was found for BSE in reducing breast cancer mortality risk 4.1.1. These studies were conducted in Russia and Shanghai. 4.2. Both studies found increase risk of benign breast biopsies with BSE.	**4. Breast Self-examination (BSE)** 4.1. BSE should not be recommended to reduce risk from breast cancer in women at average risk.
5. Methodological Issues with the Primary Studies in the Review 5.1. Limited evidence was found that addresses the effectiveness of mammography in reducing mortality risk from breast cancer for women over 70 years of age.	**5. Implications for Future Research** 5.1. Future research should assess the effectiveness of mammography in reducing mortality risk from breast cancer for women over 70 years of age.
6. Cost Benefit or Cost-effectiveness Information 6.1. No cost related information was included.	**6. Cost Benefit or Cost-effectiveness Information** 6.1. Future research should assess cost benefit or cost-effectiveness of mammography screening.

General Implications

- Mammography reduces the risk of breast cancer mortality among women 39- 49 years of age, however, the risks appear to outweigh the benefits for this age group
- Mammography has a greater mortality benefit for women 50 – 69 years of age.
- Data are insufficient to determine the effectiveness of mammography in reducing breast cancer risk among women over 70 years of age.
- Clinical Breast Examination and Breast Self Examination are not recommended to reduce risk of breast cancer mortality.

Legend: CI – Confidence Interval; OR – Odds Ratio; RR – Relative Risk
***For definitions see the healthevidence.org glossary http://www.healthevidence.org/glossary.aspx*

References used to outline issue

1. Public Health Agency of Canada. (2009). *Chronic diseases, cancer, breast cancer.* Retrieved from http://www.phac-aspc.gc.ca/cd-mc/cancer/breast_cancer-cancer_du_sein-eng.php
2. Canadian Cancer Society. (2010). *Canadian cancer statistics 2010.* Retrieved from http://tinyurl.com/32gjnhs
3. Public Health Agency of Canada, Centre for Chronic Disease Protection and Control. (2009). *Information on mammography for women aged 40 and older: A decision aid for breast cancer screening in Canada*. Retrieved from http://www.phac-aspc.gc.ca/cd-mc/mammography-mammographie-eng.php
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Other quality reviews on this topic

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- Ringash, J., & Canadian Task Force on Preventive Health Care. (2001). Preventive health care, 2001 update: Screening mammography among women aged 40–49 years at average risk of breast cancer. *CMAJ, 164*(4), 469-476.

Related links

- Canadian Breast Cancer Foundation http://www.cbcf.org/
- Canadian Cancer Society http://www.cancer.ca/sitecore/content/Home.aspx
- National Breast Cancer Coalition http://www.stopbreastcancer.org/
- Public Health Agency of Canada, Canadian Breast Cancer Initiative (CBCI) http://www.phac-aspc.gc.ca/ccdpc-cpcmc/bc-cds/cbci_main_e.html
- Women's Health Matters, Breast Cancer http://www.womenshealthmatters.ca/centres/cancer/breast/index.html

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