Computer-aided detection mammography for breast cancer screening: Evidence and implications for public health

Review Quality Rating: 8 (strong)

This systematic review and meta-analysis of 7 studies (391 978 participants) aimed to determine the effectiveness of computer-aided detection (CAD) mammography in addition to single-read mammography with regard to false-positive rates, sensitivity/specificity and cancer detection rates. Participants studied were asymptomatic women, with an average age between 40 to 60 years. Information regarding participants’ history of breast cancer, density of breast tissue, and hormonal therapy was generally not reported by the primary studies. To be included, studies required a study population of at least 10 asymptomatic women undergoing plain-film mammography for routine breast cancer screening. Studies were retrospective or prospective in design, with patients enrolled randomly or consecutively. Outcomes measured included the sensitivity/specificity, cancer detection rate, and false-positive rate of CAD. Authors report that CAD appears to increase both the recall and biopsy rate of healthy women, but that findings are difficult to generalize given the variability between study participants and participating radiologists’ familiarity with CAD.

Comments on this review’s methodology

This is a methodologically strong systematic review. A focused clinical question was clearly identified. Appropriate inclusion criteria were used to guide the search. A comprehensive search was employed using health and psychological databases, reference lists, and unpublished material. The search was limited to English-language articles. Primary studies were assessed for internal validity (e.g. research design, blinding, attrition rates, etc.) but the assessment outcomes were not clearly reported, and only one reviewer was involved in quality appraisal. Individual study characteristics were presented in either a table or narrative form, so as to allow for comparisons across studies. Heterogeneity was assessed. Appropriate analytical methods were employed to enable the synthesis of study results. Studies were weighted accordingly, through a random-effects model. The results of this review were transparent, as summative statistics were presented in the body of the review.

Why this issue is of interest to public health

Breast cancer is the second most common cancer among Canadian women (following 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 be 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?

1. Computer-aided detection (CAD) plus mammography to detect breast cancer among asymptomatic women (7 studies)
   In 3 studies, CAD plus mammography correctly detected and correctly ruled out breast cancer
   1.1. CAD plus mammography correctly detected breast cancer in women 86% of the time
       1.1.1. Sensitivity 72.2% (95% CI 84.2 – 87.6%)
   1.2. CAD plus mammography correctly ruled out breast cancer 88.2% of the time
       1.2.1. Specificity 88.2% (95% CI 88.1 – 88.3%)
   In 5 studies, CAD plus mammography detected a small number of cancers that mammography alone did not detect
   1.3. The added benefit of CAD (incremental detection) in correctly detecting breast cancer versus single read mammography was 50 per 100,000 women screened
       1.3.1. The true effect ranged from 30 to 80 per 100,000 women screened
   In 5 studies, healthy women receiving CAD plus mammography were recalled for additional testing
   1.4. Following CAD plus mammography an additional 1,190 healthy women per 100,000 were recalled (incremental recall) who would not have been recalled following single read mammography
       1.4.1. The true effect ranged from 1,090 to 1,290 women recalled (95% CI 1,090 – 1,290)
   1.5. 96% of women recalled based on CAD findings did not have cancer and 4.1% were diagnosed with cancer
       1.5.1. The true effect for no cancer ranged from 93.9 to 97.3% (95% CI 93.9 – 97.3%)
       1.5.2. The true effect for cancer diagnosis ranged from 2.7 to 6.3% (95% CI 2.7 – 6.3%)
   In 5 studies, healthy women receiving CAD plus mammography underwent biopsies.
   1.6. 80 of 100,000 healthy women received a biopsy (incremental biopsy) who would not have received a biopsy following single read mammography
       1.6.1. The true effect ranged from 60 to 100 per 100,000 women screened (95% CI 60 – 100)
   1.7. 65% of women who received a biopsy did not have cancer and 35% were diagnosed with cancer
       1.7.1. The true effect for no cancer ranged from 52.3 to 76% (95% CI 52.3-76%)
       1.7.2. The true effect for cancer diagnosis ranged from 24.7 to 48.9% (95% CI 24.7 – 48.9%)

2. Methodological Issues with the Primary Studies in the Review
   2.1. Studies included in the review included those with retrospective design and lack of blinding to clinical information.
   2.2. Quality of the included studies was moderate.

3. Cost Benefit or Cost-effectiveness Information
   3.1. No cost related information was included in the review.

Implications for practice and policy:

1. Computer-aided detection (CAD) plus mammography to detect breast cancer among asymptomatic women
   1.1. CAD plus mammography versus single read mammography may be recommended to correctly detect a small number of additional breast cancers in asymptomatic women
   1.2. Women should be advised that CAD may lead to additional recall and additional biopsies (overtreatment)

2. Implications for Future Research
   2.1. Rigorous high quality research should assess the effectiveness of CAD to detect breast cancer.

3. Cost Benefit or Cost-effectiveness Information
   3.1. Future research should assess cost benefit or cost-effectiveness of the interventions.

General Implications
- Computer assisted detection systems (CAD) plus mammography versus single read mammography may be recommended to correctly detect a small number of additional breast cancers in asymptomatic women.
- Women should be advised that CAD may lead to additional recall and additional biopsies (overtreatment).

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


Other quality reviews on this topic


Related links

- Canadian Cancer Society [http://www.cancer.ca/sitecore/content/Home.aspx](http://www.cancer.ca/sitecore/content/Home.aspx)

Suggested citation


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