Annual screening with mammography and breast examination did not reduce breast cancer mortality in women 40–49 years of age


QUESTION: In women 40–49 years of age, does annual screening with mammography, clinical breast examination (CBE), and breast self examination (BSE) instruction reduce breast cancer mortality to a greater extent than a single CBE and BSE instruction?

Design
Randomised (allocation concealed*), blinded (outcome assessors),* controlled trial with mean 13 years of follow up.

Setting
15 centres in Canada.

Patients
50 489 women who were 40–49 years of age and had no previous diagnosis of breast cancer, were not pregnant, and had not had mammography in the previous 12 months. 50 430 (99.9%) were included in the analysis.

Intervention
All women received an initial CBE and instruction on BSE and were allocated to annual screening comprising mammography, CBE, and instruction and evaluation on BSE (n=25 214) or to usual care (n=25 216).

Main outcome measure
Breast cancer mortality.

Main results
Analysis was by intention to treat. During the first 5 years after study entry, the groups did not differ for breast cancer mortality rates and did not differ at each successive year of follow-up to ≥9 years (table). 105 breast cancer deaths occurred in the mammography group and 108 in the usual care group. The study had 80% power to detect a 40% difference in breast cancer mortality between groups after 5 years.

Conclusion
In women 40–49 years of age, annual mammography and breast self examination did not reduce breast cancer mortality more than a single breast examination and usual health care.

*See glossary.

Annual breast cancer screening including mammography vs usual care to prevent breast cancer mortality

<table>
<thead>
<tr>
<th>Years of follow up</th>
<th>Breast cancer mortality rates/10 000 women</th>
<th>Rate ratio (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2–5</td>
<td>2.26</td>
<td>1.07 (0.75 to 1.52)</td>
</tr>
<tr>
<td>6</td>
<td>2.55</td>
<td>1.01 (0.73 to 1.41)</td>
</tr>
<tr>
<td>7</td>
<td>3.04</td>
<td>1.05 (0.78 to 1.42)</td>
</tr>
<tr>
<td>8</td>
<td>3.29</td>
<td>1.04 (0.78 to 1.40)</td>
</tr>
<tr>
<td>≥9</td>
<td>3.72</td>
<td>0.97 (0.74 to 1.27)</td>
</tr>
</tbody>
</table>

*All comparisons are not significant.

COMMENTARY
At first glance, these 2 reports seem inconsistent: The study by Miller et al is an update of the Canadian National Breast Screening Study, continuing to show no hint of benefit in women 40–49 years of age; the review by Humphrey et al is a USPSTF meta-analysis extending a recommendation for mammography to this age group for the first time. Ironically, the Canadian study was judged to be the highest quality study of all those evaluated by the USPSTF. Even with >50 000 participants, the Canadian study did not have the power to detect a protective effect < 40%; the USPSTF meta-analysis found a much smaller benefit of 15% in the 40–49 year age group. The 95% confidence intervals/credible intervals of the reduction in breast cancer mortality in the 2 studies (0.74 to 1.27 v 0.73 to 0.99) overlap widely. The absolute reduction in breast cancer mortality is low in all age groups. For women 40–49 years of age, it is estimated to be <1/10 000 per year. For older women, the benefit is slightly greater and the confidence intervals more clearly exclude the null result.

At what price is this modest benefit obtained? Surprisingly, in the appendix the USPSTF states: “A systematic review of adverse effects was beyond the scope of our review.” The evidence for adverse effects includes false positive results, believed to occur in 6.5% of mammograms;1 radiogenic breast cancer, estimated to be <1/10 000 per year. For older women, the benefit is slightly greater and the confidence intervals more clearly exclude the null result.

In the Canadian study, about 14% more diagnoses of in situ or invasive breast cancer occurred in the screened group than in the usual care group; this difference persisted to almost 10 years after the intervention ended. In 2 Swedish trials including older women, 35% more women received major surgery (mastectomy or lumpectomy) and 25% more women received radiation in the screened groups.2 These results suggest that this may be a more substantial problem than previously thought.

How can we convey these results to our patients? For women 40–49 years of age, the estimated benefit of mammography is small (15%, or < 1/10 000 breast cancer deaths prevented per year) and the evidence of benefit is weak, with confidence intervals nearly overlapping 1. The risk of false positive results is higher at this age, as is the potential for radiation carcinogenesis.3 The absolute benefit might be greater in women at high risk because of a positive family history.
Review: mammography reduces breast cancer mortality rates

QUESTION: How effective is breast cancer screening with mammography, clinical breast examination (CBE), and breast self examination (BSE) in preventing breast cancer mortality?

Data sources
Studies were identified by searching Medline (1994–2001), Premedline (December 2001 to February 2002), and the Cochrane Controlled Trials Register; reviewing the reference lists of previous reviews, commentaries, and meta-analyses; and contacting experts in the field.

Study selection
Studies were selected if they were randomised controlled trials (RCTs) of breast cancer screening and had a relevant clinical outcome (advanced breast cancer, breast cancer mortality, or all cause mortality).

Data extraction
Data were extracted on patient population, study design, potential flaws, missing information, analysis, and length of follow up. US Preventive Services Task Force (USPSTF) criteria were used to assess study quality (good, fair, or poor). The primary endpoint was breast cancer mortality.

Main results
8 RCTs (479,987 women) (154 publications) met the selection criteria: 4 evaluated mammography, and 4 evaluated mammography plus CBE. 7 trials were rated fair quality, and 1 was rated poor quality. The mean follow up was 14 years. Meta-analysis of the 7 fair trials showed that mammography screening led to a modest reduction in breast cancer mortality across all age groups, with greater benefit conferred in older women (table). The results were consistent with those of 5 of 7 previous meta-analyses identified in the search for trials.

Mortality reductions in trials of mammography plus CBE were similar to those of trials of mammography alone. 2 RCTs of BSE met the selection criteria. Both trials showed no difference in breast cancer mortality rates in women instructed in BSE and in non-instructed women.

Conclusions
Fair quality evidence from randomised controlled trials shows that mammography screening is effective in reducing breast cancer mortality. Biennial and annual screening are equally effective. Clinical breast examination confers no additional benefit. Instruction in breast self examination, as a single screening method, is ineffective.

Screening with mammography v usual care to prevent breast cancer mortality at mean 14 years follow up

<table>
<thead>
<tr>
<th>Age groups</th>
<th>Number of trials†</th>
<th>RRR (95% CrI)</th>
<th>NNS (CrI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>All ages (39–74 y)</td>
<td>7</td>
<td>16% (9 to 23)</td>
<td>1224 (665 to 2564)</td>
</tr>
<tr>
<td>&lt;50 years</td>
<td>7</td>
<td>15% (1 to 27)</td>
<td>1792 (674 to 10 540)</td>
</tr>
<tr>
<td>≥50 years</td>
<td>7</td>
<td>22% (13 to 30)</td>
<td>838 (494 to 1676)</td>
</tr>
</tbody>
</table>

*Crl = credible interval; NNS = number needed to screen. Other abbreviations defined in glossary.
†The meta-analysis excluded the trial rated as poor quality.