Estimating the accuracy of screening mammography: a meta-analysis

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Authors' objectives
To estimate the accuracy of mammographic screening.

Searching
MEDLINE was searched using the MeSH term 'mammography' combined with author searches or keyword searches for study identifiers (e.g. Malmo, UK etc.). An additional search was performed using the keywords 'mammography' and 'screening'. The bibliographies of identified articles were also reviewed.

Study selection

Study designs of evaluations included in the review
Randomised controlled trials (RCTs), population-based case-controlled studies, and demonstration projects were eligible for inclusion in the review.

Specific interventions included in the review
Studies of mammography alone, or mammography plus breast physical examination were eligible for inclusion in the review.

Reference standard test against which the new test was compared
No inclusion criteria relating to any reference standard test were specified. The reference standard used in included studies was follow-up at one and/or two years.

Participants included in the review
No inclusion criteria relating to the participants in primary studies were specified. Included participants were women between the ages of 30 and 74 years

Outcomes assessed in the review
Studies were included if enough information was reported to calculate true positive and false positive rates for the first round of screening. False-positives were defined as cases in whom a further evaluation for cancer following referral was negative. Accuracy measures were calculated at one and two years, and in women over 50 years of age compared with younger women. Percentage compliance was also reported in the review.

How were decisions on the relevance of primary studies made?
The authors do not state how the papers were selected for the review, or how many of the reviewers performed the selection.

Assessment of study quality
The authors do not state that they assessed quality.

Data extraction
Data were reviewed independently by the authors (it is not stated how many of the three reviewers looked at each study); calculations were compared and discrepancies resolved.

Data were extracted on: total number of participants; age range and percentage under 50 years of participants; details of mammographic technique; screening interval; percentage compliance; numbers of true and false positives.
Methods of synthesis

How were the studies combined?
Due to statistically significant heterogeneity the results of individual studies were not combined, but were reported in a narrative summary.

The FPR and TPR values from each study were plotted in receiver operating characteristic (ROC) space, providing visual representation of the screening accuracy reported in individual studies.

How were differences between studies investigated?
Chi square and Kardama-Kardaun tests for heterogeneity were performed to assess the validity of using summary ROC curves or a single plot to summarise the data (see Other Publications of Related Interest).

Results of the review

Eight studies (5 RCTs, 2 case-control studies, and 1 demonstration project) with a total of 263 359 women were included in the review. Six studies were included in the first analysis (mammography alone) with a total of 207 643 women. Two additional studies were included in the second analysis (mammography plus physical breast examination) with a total of 57 716 women.

Mammography only studies (n=6 studies):

The reported TPR values for all ages combined, based on a 1-year screening interval varied from a low of 83% sensitivity to a high of 95% sensitivity. The FPR ranged from a low of 0.9% to a high of 6.5%. When a two-year interval was used, the median TPR was 71% compared to 89.5% for a first screen with one year of follow-up. Age adjustments had only a small effect on the values, but the sensitivity is higher in women over 50 years of age.

Significant statistical heterogeneity was found by both tests.

Mammography plus physical breast examination (n=2 studies in 3 locations):

These studies did not have appreciably higher sensitivity (93-97% at one year) or specificity (2-6.1%).

Authors' conclusions

The accuracy of mammography should be recognised and included in discussions about policies for screening for breast cancer. This meta-analysis, by quantifying the expected TPR/FPR, should assist programme planners, physicians, and women to understand better the cost and clinical implications of such screening programmes.

CRD commentary

The review addressed a clear research question and the inclusion and exclusion criteria were well defined. The literature search was limited to published trials retrieved from one electronic database and reference lists. It is possible, therefore, that relevant studies may have been missed. The searches were also partly based on a selected set of known studies which could have narrowed the search and excluded other relevant studies.

The authors did not report on how the articles were selected, or how many of the reviewers selected the articles and extracted the data. Furthermore, no assessment of the quality of the trials was undertaken. It therefore remains a possibility that biases introduced by methodological flaws in the primary studies and/or weaknesses in the review methodology may have prejudiced the results of the review.

The results were appropriately summarised graphically and in a narrative synthesis, and differences between the studies were discussed in the text. The impact of study design on heterogeneity could have been investigated as the inclusion of four were RCTs, two case-control studies and one demonstration project seems a likely source. It is also unclear why other studies designs such as controlled trials or cohort studies were excluded. Limited details of the participants in the primary studies were reported.
The author’s appropriately conclusions are cautious given the limitations of the available evidence.

**Implications of the review for practice and research**

Practice: The authors do not state any implications for practice.

Research: The authors state that further research is needed on the effect of hormone replacement therapy (HRT) on the sensitivity and specificity of mammography in older women.

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**Other publications of related interest**


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