Performance of radiographers in mammogram interpretation: a systematic review
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CRD summary
The review compared the performance of radiographers with that of radiologists, in mammogram interpretation. Reporting of the review process was limited and data were insufficient to support firm conclusions. The authors' conclusion, that further research is needed, is appropriate.

Authors' objectives
To compare the performance of radiographers with that of radiologists in the interpretation of mammograms. To assess the effect of training on the performance of radiographers, and to assess any effects of involving radiographers in routine mammogram interpretation on the performance characteristics of this test.

Searching
PubMed, EMBASE, Scirus, PsycINFO and Oxford Journals were searched from inception to December 2006. Search terms were reported. Studies published in English, German, French or Dutch were eligible for inclusion.

Study selection
Studies whose primary aim was to evaluate the performance of a radiographer (including technologists and physician assistants), which reported sensitivity and specificity (or sufficient data to calculate these) were eligible for inclusion. The gold standard had to be follow-up of at least one year and/or a pathology report or use of a validated test.

All included studies were screening studies conducted in the US or UK; prevalence of malignancy ranged from 0.45 to 25%. The majority of studies were double reading studies, comparing the performance of experienced radiologists with that of relatively inexperienced radiographers.

An initial screening of abstracts and titles was used to exclude studies that were clearly not relevant (number of reviewers not reported). Three reviewers independently applied the full inclusion criteria to the selected articles.

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

Data extraction
Data were extracted on: the mammogram investigation (double or pre-reading, blinded or non-blinded reading, test set or consecutive series of patients, pre- and post-training measurement); reader characteristics (profession, number of professionals, years of experience, specific training in mammogram evaluation); and results.

The authors did not state how many reviewers performed the data extraction.

Methods of synthesis
Results were presented as a narrative synthesis and tables, grouped by mammogram interpretation performance, effects of training, and effects of reader on routine clinical practice.

Results of the review
Six studies, assessing more than 22,000 mammograms (range 793 to 17,202), were included in the review. Four studies used radiographers in double reading of mammograms, in one study mammograms were pre-read by radiographers, and in the remaining study radiographers were the sole readers.

Mammogram interpretation performance: Four studies indicated that interpretation by radiographers was poorer than for radiologists, due to higher numbers of false positives: Specificities ranged from 81 to 95% for radiologists and from 64 to 91% for radiographers; sensitivities were similar for radiologists (73 to 86%) and radiographers (73 to 90%).
Effects of training: Five studies included a training programme for mammogram readers (variable duration and content) and three studies assessed the performance of radiographers before and after training and all recorded an increase in diagnostic odds ratio, but differences between the reported before and after training diagnostic odds ratios were not statistically significant.

Effects of reader on routine clinical practice: No studies were identified that assessed the effects of routine employment of radiographers in the reading of mammograms on sensitivity and specificity.

Authors' conclusions
In a screening setting, radiographers scored higher false positives, with similar sensitivities, to radiologists. Training could improve performance. No studies assessed the performance of radiographers interpreting diagnostic mammograms in a consecutive population in a clinical setting. Further research is needed.

CRD commentary
The review addressed a number of clearly stated research questions and the related inclusion criteria were broad but appropriate. A number of sources were searched for relevant studies, but language restrictions may have resulted in loss of relevant data and the possibility of language bias remains. Measures were taken to minimise error and bias in the study selection process, but it was unclear whether these measures extended to data extraction. No assessment of the methodological quality of the included studies was reported. The authors' conclusions were based on data from a small number of studies, and their cautious interpretation and recommendation for further research is appropriate.

Implications of the review for practice and research
Practice: The authors made no recommendations for practice.

Research: The authors stated that a well-designed diagnostic cost-effectiveness study is needed to assess the feasibility of deploying radiographers in the interpretation of diagnostic mammograms. Such a study should employ an appropriate gold standard (known pathology and follow-up of at least one year), evaluate which strategy (double reading, or pre-reading) will be sufficient in clinical practice, and include adequate pre-study training.

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