Use of prior mammograms in the transition to digital mammography: a performance and cost analysis
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Record Status
This is a critical abstract of an economic evaluation that meets the criteria for inclusion on NHS EED. Each abstract contains a brief summary of the methods, the results and conclusions followed by a detailed critical assessment on the reliability of the study and the conclusions drawn.

CRD summary
The aim was to examine the costs and the detection performance of digital mammography, with or without previous film mammograms, in the UK NHS breast screening programme. The authors concluded that either digitised or non-digitised film mammograms improved the performance of digital screening and saved costs by reducing the number of normal cases who were unnecessarily recalled. There were concerns with the study size, case-selection methods, and content of costs making the authors’ conclusions uncertain.

Type of economic evaluation
Cost-effectiveness analysis

Study objective
The aim was to examine the costs and the detection performance of digital mammography, with the use of prior film mammograms, in the UK NHS breast screening programme, to determine the best transition method from film to digital mammography.

Interventions
Three methods of digital mammography were considered: using previous film mammograms, using digitised film mammograms, or without the previous mammograms. Digital mammograms used the MicroDose Mammography system, while film mammograms used a Mammomat 3000 Nova and Kodak film, and these were digitised using an Array 2905 Laser Film Digitiser.

Location/setting
UK/primary care.

Methods
Analytical approach:
One single-centre study provided the clinical data for the analysis. The authors stated that the perspective was that of the UK NHS.

Effectiveness data:
In the source study, mammography cases were selected from eight radiographers, in one UK breast screening centre, from March 2005 to June 2007. A random sample of 160 mammograms (94 normal or benign, and 66 malignant), from women aged 50 to 70 years, was selected. Each mammogram was read three times on a digital workstation; once with the previous mammogram, once with a digitised previous mammogram, and once without a prior mammogram. At least one month elapsed between reading the same cases, with no more than 54 cases read at one sitting. The main clinical outcomes were the probabilities of malignancy and abnormalities being present, the lesion location, and the rates of false-positive and false-negative cases, for each participant. Jackknife free-response receiver operating characteristic (JAFROC) analysis and analysis of variance were used to compare the differences between the three mammography methods.

Monetary benefit and utility valuations:
Not relevant.
Measure of benefit:
The measures of benefit were the JAFROC figure of merit (FoM) and the proportion of false-positive cases (normal cases who were recalled).

Cost data:
The direct medical costs included equipment, staff time, and increases in recall per 10,000 women screened. Digitisation equipment was valued over three years, using its purchase and maintenance contract prices for 2010. Biopsy consumables included fine-needle aspiration, core biopsy, and vacuum-assisted biopsy needles. Staff time included training, administration, and extra assessment clinics. These costs (equipment and staff time) were from a 2004 published study, adjusted to 2010 using the retail price index. NHS pay scales (2006) were used for valuing staff time. All costs were reported in £ and converted to Euros (EUR), at £1 equals EUR 1.18; the price year was 2010.

Analysis of uncertainty:
Not stated.

Results
Compared with no prior mammogram, digitised mammograms were superior (difference in FoM 0.03, 95% CI 0.01 to 0.06) as were the original film mammograms (difference in FoM 0.03, 95% CI 0.009 to 0.05). There were no differences in performance between the digitised and the original mammograms. With no prior mammograms, the number of false-positive cases was 24% higher than with film mammograms and 28% higher than with digitised film mammograms.

The total cost per 10,000 women was £11,114 (EUR 13,115) for digitised mammograms, £6,451 (EUR 7,612) for film mammograms, and £11,581 (EUR 13,666) for no prior mammograms. The base cost of screening per woman in the UK was £45.50 (EUR 54). The increase in cost per woman screened, taking into account the increase in unnecessary recalls, was 1.4% for film mammograms, 2.4% for digitised mammograms, and 2.5% for no prior mammograms.

Authors’ conclusions
The authors concluded that either digitised or non-digitised previous film mammograms improved the performance of digital breast cancer screening, during the transition from film to digital. Either method also saved costs, compared with no prior mammogram, by reducing the number of normal cases who were unnecessarily recalled.

CRD commentary
Interventions:
The strategies were described and justified. These strategies might be acceptable in other settings, depending on the additional staff and time resources available, and considering that the source study was conducted in one centre, which might differ from others.

Effectiveness/benefits:
Easy cases were excluded to over represent abnormal cases, to maximise power; this selection bias reduces the generalisability of the results. The authors acknowledged that the generalisability of their study was limited and could have been enhanced by using more radiographers and a wider range of screening centres. But the radiographers met the normal ranges of performance according to UK breast screening audits.

Costs:
The methods used for the cost analyses were clearly stated. The unit costs and quantities were not separately reported. The cost analysis was basic and some costs were omitted, such as the physical space for film multi-viewsers, target outcomes, and organisational changes, which the authors stated might affect the overall costs. No sensitivity analyses were reported, making it uncertain whether the cost findings were robust.

Analysis and results:
The health outcomes and costs were not combined into incremental cost-effectiveness ratios; both comparators were more effective and cheaper than not using previous mammograms. Sensitivity analyses were not undertaken and these are standard practice in economic evaluations to assess the uncertainty in the results. A larger study could fully consider the costs and performance outcomes of using prior mammograms, with or without digitisation.
Concluding remarks:
There were some concerns about the generalisability of the clinical findings and the content of the costs, which make the results uncertain. This makes it difficult to judge the authors' conclusions.

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