Continuing screening mammography in women aged 70 to 79 years: impact on life expectancy and cost-effectiveness


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.

Health technology
Screening mammography for specified time intervals and bone mineral densities in women aged 70 to 79 years.

Type of intervention
Screening.

Economic study type
Cost-effectiveness analysis.

Study population
General population (hypothetical) of women aged 65 years or older.

Setting
Outpatient screening clinic. The study was carried out in the USA.

Dates to which data relate
Effectiveness data were collected from studies published between 1988 and 1998. Resource use data were collected from studies published between 1993 and 1995. Cost data were collected from studies published between 1994 and 1995. The price year was 1998.

Source of effectiveness data
Effectiveness data were derived from a literature review and estimates made by the authors.

Modelling
A Markov decision analytic model was used to determine the cost-effectiveness of the three screening strategies.

Outcomes assessed in the review
The review assessed the following outcomes: mortality, incidence of invasive breast cancer, incidence of ductal carcinoma in situ (DCIS), percentage mortality reduction for invasive cancer associated with screening, percentage breast cancer mortality from invasive disease and from DCIS, and percentage incidence for breast cancer associated with quartile distal radius BMD.

Study designs and other criteria for inclusion in the review
Not stated.
Sources searched to identify primary studies
Not stated.

Criteria used to ensure the validity of primary studies
Not stated.

Methods used to judge relevance and validity, and for extracting data
Summary statistics from individual studies.

Number of primary studies included
At least 15 primary studies were included.

Methods of combining primary studies
Narrative method.

Investigation of differences between primary studies
Not stated.

Results of the review
Breast cancer mortality did not fall among screened women aged 50 to 69 years for about 5 years after the initiation of screening. Mortality from DCIS in the screened groups was assumed to be the same as the mortality rate from DCIS after the widespread use of screening mammography. The 10-year mortality rate from invasive breast cancer after detection of DCIS was 1.9%. For those who did not continue to undergo screening mammography, a 10-year mortality rate of 3.5% was used. Women in the lowest quartile of BMD (\(< 0.3 \, \text{g/cm}^2\)), had a 39% reduction in breast cancer risk and those in the upper 3 quartiles had a 13% increase in risk.

Methods used to derive estimates of effectiveness
Assumptions made by the authors due to gaps in the literature on required data for the model.

Estimates of effectiveness and key assumptions
Screening mammography reduced breast cancer mortality in women aged 65 years or older by 27%, as it does in women aged 50 to 69 years.

Measure of benefits used in the economic analysis
Deaths due to breast cancer averted and life expectancy were used as the measures of benefit. Benefits were discounted at an annual rate of 3%.

Direct costs
Direct costs were discounted at an annual rate of 3%. Quantities and costs were reported separately. Direct costs included costs related to breast cancer detection and treatment (screening mammography, evaluation of an abnormal mammography result, and treatment of DCIS, and invasive breast cancer). The quantity/cost boundary adopted was that of the health service. The estimation of quantities and costs was based on actual data. The costs of screening mammography were based on the average cost reported by the National Cancer Institute's National Survey of Mammography Facilities. The costs of evaluating abnormal mammography results were collected from Medicare,
Pennsylvania Blue Cross, Group Health Cooperative, and Kaiser. The cost of treating DCIS and invasive cancer was based on costs reported by Group Health Cooperative. All costs were inflated to 1998 US dollars using the consumer price index for medical services.

**Statistical analysis of costs**
Not reported.

**Indirect Costs**
Not included.

**Currency**
US dollars ($).

**Sensitivity analysis**
Sensitivity analyses were performed on the discount rate, efficacy of screening mammography, reduction in breast cancer risk associated with the lowest quartile of BMD, and breast cancer mortality from invasive cancer at 10 years.

**Estimated benefits used in the economic analysis**
If 10,000 65-year-old women were screened biennially until the age of 69 years and then followed up clinically to age 85 years, 148 would die of breast cancer by age 85, while 167 women would die of another cause after the diagnosis of invasive breast cancer. A total of 4,273 women would die of other causes without known breast cancer. Applying the check BMD strategy to this cohort would avert 9.4 deaths, 14 breast cancer deaths would be prevented, but 4.6 of these women would die of other causes. Expanding the mammography screening programme to include screening for all women until age 79 years would avert 1.4 additional deaths among the 25% of women in the lowest quartile of BMD, 3 breast cancer deaths would be prevented, but 1.6 of these women would die of other causes. If 10,000 65-year-old women were screened biennially until the age of 69 years and then followed up clinically to age 85, 70 women would be diagnosed as having DCIS and, of these, 1 would die of invasive breast cancer.

Under the check BMD strategy, another 55 cases of DCIS would be diagnosed for a total of 124 cases and still only 1 woman would die of invasive breast cancer. Expanding the mammography screening programme to include screening for all women until age 79 would result in an additional 10 cases of DCIS being diagnosed among the 25% of women in the lowest quartile of BMD without averting an additional death from invasive breast cancer. Compared with mammography screening biennially, the check BMD strategy saved about 2 days of life per woman screened. To avert one death from invasive breast cancer, 1,064 women would have to be enrolled. This equals 2,011 mammography examinations per death averted. Screening all women until age 79 saved an additional 0.3 days of life per woman screened compared with the check BMD strategy. 7,143 women would have to be enrolled to avert 1 additional death from breast cancer and this would result in 9,963 additional mammography examinations.

**Cost results**
Applied to a cohort of 10,000 women, the costs of screening from ages 65-69 were $27.54 million, check BMD strategy cost $31.45 million, and screening from ages 65-79 amounted to $32.53 million.

**Synthesis of costs and benefits**
Compared with screening all women until age 69, the incremental cost-effectiveness ratio of the check BMD strategy was $66,773 per life year saved. The incremental cost-effectiveness ratio for screening all women until age 79 compared with the check BMD strategy was $117,689 per life year saved and compared with the reference case it was $73,855 per life year saved. These results were sensitive to changes in the discount rate.
Authors' conclusions
Continuing mammography screening after age 69 results in a small gain in life expectancy and is moderately cost-effective in those with high BMD and more costly in those with low BMD. Women's preferences for a small gain in life expectancy and the potential harms of screening mammography should play an important role when elderly women are deciding about screening.

CRD COMMENTARY - Selection of comparators
A justification was given for the comparators used, namely the authors noted that the benefit of screening may depend on the age and bone mineral density of women. You, as the user of this database, should decide if these are widely used health technologies in your own setting.

Validity of estimate of measure of benefit
The authors did not state that a systematic review of the literature had been undertaken and effectiveness estimates were combined using narrative methods. The authors did not seem to investigate differences in the primary studies they used. The authors also noted that the efficacy of mammography in older women is unknown. These factors raise some concerns about the validity of the estimates of benefit. The authors utilised two valid measures of health benefits in the economic analysis.

Validity of estimate of costs
All categories of costs relevant to the perspective adopted were included in the analysis. For each category of costs, all relevant costs were included. Costs and quantities were reported separately. A sensitivity analysis of costs was conducted which enhances the validity of the cost results. The price year was 1998.

Other issues
The authors did make appropriate comparisons of their findings with those from other studies and the issue of generalisability to other settings was addressed. The authors did not present their results selectively in order to influence the findings. The harm caused by false-positive test results was addressed in terms of the costs incurred but not in terms of intangible outcomes such as anxiety. The study examined elderly women aged 65 years or older and this was reflected in the authors' conclusions. Some further points should be taken into account in future studies. Firstly, it may be possible to consider the psychological benefit of reassurance associated with a normal mammography result, and the psychological benefit derived from less disfiguring procedures available to treat earlier stage disease (although this would require utility-based outcome analyses, which were outside the authors' study question). It would also be beneficial to consider interventions that may be started among women with low BMD that may influence breast cancer risk.

Implications of the study
Women's preferences for a small gain in life expectancy and the potential harms of screening mammography should play an important role when elderly women are deciding about screening.

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