A Bayesian approach to analysing the cost-effectiveness of two primary care interventions aimed at improving attendance for breast screening


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
The study compared four primary care strategies aimed at improving attendance for breast screening among all women invited for breast screening and non-attenders. The interventions compared were a letter intervention, the flag intervention, both interventions (i.e. letter plus flag) and no intervention (i.e. no intervention on top of current practice). The letter intervention consisted of a letter, a translation sheet and a National Health Service (NHS) breast screening information leaflet. The flag intervention comprised a coloured encounter form, located in the primary care notes, to remind health professionals to mention breast screening at any routine consultation and to administer the NHS breast screening information leaflet to the woman.

Type of intervention
Primary prevention.

Economic study type
Cost-effectiveness analysis.

Study population
There were two study populations. The first comprised all women invited for breast screening and the second comprised non-attenders. However, inclusion or exclusion criteria were not reported. The authors only reported limited information for this field, referring instead to two clinical papers (Richards et al. 2001 and Bankhead et al. 2001, see 'Other Publications of Related Interest' below for bibliographic details).

Setting
The setting was primary care. The economic study was carried out in the UK.

Dates to which data relate
The dates to which the effectiveness evidence referred were not reported in the current study. Details were reported in the parent clinical studies (Richards et al. 2001 and Bankhead et al. 2001). The cost data were derived from sources published in 1998 and 2001. All costs were reported for the price year 2001 to 2002.

Source of effectiveness data
The effectiveness data were derived from two studies.

Link between effectiveness and cost data
The costing appears to have been carried out prospectively on the same sample of patients as that used in the effectiveness study.
Study sample
The authors only reported limited information for this field, referring instead to the parent clinical studies (Richards et al. 2001 and Bankhead et al. 2001).

Study design
The analysis was based on two randomised controlled trials. The number of centres included in the studies and further information on the study design were not reported the current study. Details were given in the parent clinical studies (Richards et al. 2001 and Bankhead et al. 2001).

Analysis of effectiveness
The authors only reported limited information under this heading. Details were given in the parent clinical studies (Richards et al. 2001 and Bankhead et al. 2001). The primary outcome used in the analysis was the proportion of attendance for breast screening.

Effectiveness results
The effectiveness results of the randomised controlled trials were not reported. Individual patient data were used as inputs to the probabilistic model.

Clinical conclusions
No clinical conclusions were drawn from the trials since individual patient data were used in a statistical model for the decision analysis.

Modelling
The authors developed a probabilistic decision analytic model using Markov chain Monte Carlo simulation, carried out with the specialist Bayesian statistical software WinBUGS, to evaluate the cost-effectiveness of the primary care interventions. The model was populated using economic and effectiveness data collected alongside two randomised controlled trials. In addition, the authors used a statistical model to impute the probability of attendance. The probability of attendance was assumed to follow a binomial distribution. It was also assumed that the probability of attendance had additive properties on the log-odds scale that each general practitioner (GP) had a different attendance rate at baseline.

Measure of benefits used in the economic analysis
The number of attendances achieved by each intervention was used as the measure of benefit. It was derived from a statistical model that utilised the individual patient data from the two parent clinical studies.

Direct costs
The following health service costs were included in the analysis.

For the letter intervention: material costs (including the cost of the letter paper, envelope, translation sheet and stamp), cost of the informational leaflet, cost of clerical staff mean time (in minutes) to type and send letter, and gross average hourly pay (GAHP) for clerical staff.

for the flag intervention: material costs (cost of printing a flag), GP cost for producing an early prior notification list (PNL), clerical staff mean time (minutes) to check the early PNL and to insert one flag, GAHP for clerical staff, clerical staff mean time (minutes) to remove an ineligible flag, mean extra consultation time due to a flag activated by a GP, and mean extra consultation time due to a flag activated by a nurse.

The cost to the health service of an attendance for screening was also included.
The costs and the quantities of resources used were reported separately. Market prices paid in the trials were used for stationery and printing costs. Further costs were derived from published sources. All quantities of resources used were derived from the randomised trials. It was reported that the GAHP was inflated by 1.392 to reflect further costs (national insurance, superannuation and overhead costs). Discounting was not relevant as the costs were incurred during less than 2 years. All costs were reported for the price year 2001 to 2002.

**Statistical analysis of costs**
The cost data were treated stochastically.

**Indirect Costs**
The indirect costs were not included in the analysis.

**Currency**
UK pounds sterling ( ).

**Sensitivity analysis**
A probabilistic sensitivity analysis was carried out. The statistical model used to determine the probability of attendance was clearly reported, and all the probability distributions of the resource use used to calculate the cost were reported. A sensitivity analysis was conducted to investigate the robustness of the results when excluding an early PNL. This was demonstrated by putting the following parameters to zero: the cost of producing an early PNL per GP, clerical staff mean time to check the early PNL, the proportion of ineligible women checked on the early PNL and not flagged per eligible woman, and the proportion of ineligible women whose flag was removed per eligible woman.

**Estimated benefits used in the economic analysis**
The authors only reported the incremental benefits (additional attendances achieved by each intervention compared with no intervention).

Of all invited women (n=256), the letter alone intervention resulted in 25.2 additional attendances, the flag alone intervention in 22.3 additional attendances, and the combined intervention (letter plus flag) in 29.9 additional interventions.

Of the non-attenders (n=89), the letter alone intervention resulted in 3.5 additional attendances, the flag alone intervention in 4.1 additional attendances, and the combined intervention (letter plus flag) in 5.8 additional attendances.

**Cost results**
An incremental analysis of the costs was conducted. The total costs were reported as the mean additional costs of each intervention in comparison with no intervention.

The total mean additional NHS costs for all invited women (n=256) were 690 with the letter intervention, 1,122 with the flag intervention, and 1,487 when the flag and letter interventions were combined.

The mean total annual additional costs incurred by the general practice (i.e. excluding the costs of the screen, NHS breast screening leaflet, and production of the early PNL) were 174 (25.2%) with the letter intervention, 685 (61.0%) with the flag intervention, and 859 (57.7%) with the combined intervention. The percentages in parentheses indicate the proportion of the additional cost of each intervention incurred by general practices.

For non-attenders (n=89), the mean additional NHS costs were 143 with the letter intervention, 244 with the flag intervention, and 354 with the combined intervention.

The mean total annual additional costs incurred by general practices were 61 (42.5%) with the letter intervention, 162
(66.5%) with the flag intervention, and 223 (63.0%) with the combined intervention.

Synthesis of costs and benefits
An incremental cost-effectiveness analysis was performed. The incremental cost-effectiveness ratio (ICER) was estimated as the additional cost per additional attendance for screening compared with the next most effective intervention.

For all women invited (n=256), the ICER for the letter intervention compared with no intervention was 27.34 per additional attendance. The ICER for the combined intervention (letter and flag) compared with the letter intervention alone was 170.64 per additional attendance.

For non-attenders (n=89), the ICER for the letter intervention compared with no intervention was 40.92. The ICER for the combined intervention compared with the letter intervention was 90.06.

The flag intervention was dominated in both groups.

A cost-effectiveness acceptability frontier was produced, where the probability of a strategy being cost-effective was plotted against the maximum value society allocates to an attendance for screening. The monetary value assigned to screening attendance ranged from 0 to 250. The expected value of perfect information was also determined over this range of values.

There was considerable uncertainty in the model, but the value of additional information is low and the decision-maker should base the decision on the value attached to an additional attendance.

The sensitivity analysis demonstrated that the results were robust when excluding the PNL. However, the ICER for the combined intervention compared with letter alone was sensitive to the assumption that the (prior value assigned) interaction is unlikely to exceed the magnitude of the main effects.

Authors' conclusions
"The flag intervention alone does not appear to be an efficient option. The choice between the letter and both interventions combined is subjective depending on the willingness to pay for an additional screening attendance."

CRD COMMENTARY - Selection of comparators
A justification was given for the comparators used. The no intervention option (i.e. no additional intervention) represented current practice in the authors' setting. You should decide if this represents a widely used technology in your own setting.

Validity of estimate of measure of effectiveness
The analysis was based on two randomised controlled trials. However, it is impossible to comment on the validity of the studies since they were described in detail in separate clinical papers.

Validity of estimate of measure of benefit
The authors used the number of attendances achieved as the measure of benefit. This was derived from the two parent studies.

Validity of estimate of costs
The analysis of the costs was performed from the perspective of the health service paying for the intervention. All the relevant cost categories appear to have been included in the analysis. The costs and the quantities were reported separately, thus enhancing the reproducibility of the study in other settings. The costs and quantities were treated stochastically and extensive sensitivity analyses were conducted to assess the robustness of the estimates used. The
ranges used appear to have been appropriate. In addition, the price year was reported, which will aid any future reflation exercise.

**Other issues**
The authors did not compare their study findings with those of previous studies. However, this might have been due to a lack of studies in this research area. The issue of generalisability of the results to other settings was not addressed. The results of the study do not appear to have been reported selectively. The authors did not report any limitations to their study.

**Implications of the study**
The authors did not make explicit recommendations for changes in policy or practice, or any recommendation for further research.

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