The safety net: a cost-effective approach to improving breast and cervical cancer 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
Different interventions to deliver breast and cervical screening to women who were unscreened for 3 years or more were investigated. The following interventions were considered in the study.

Letter/letter. The women received a letter indicating that there was no record of their having received a mammogram or Pap smear during the prior 3 years, emphasising the need of being screened, and offering them the opportunity to arrange an appointment. Those women not screened 6 weeks later were sent a second letter emphasising the importance of screening, and were again provided with a number to call for an appointment.

Letter/phone. The women received the same initial letter mentioned above. If they were not screened after 6 months, they received a phone call from the study interventionist who offered to schedule an appointment, answered questions, addressed concerns and discussed the importance of an examination.

Phone/phone. The women received two sequential phone calls, the second one coming 6 weeks after the first if they had not been screened in the interim. The specific issues addressed included the safety and efficacy of screening, its ready availability, and its ease of scheduling and administration.

These three interventions were then compared with the usual care. With usual care, the screening of women was monitored through information systems, but no intervention was delivered beyond routine system and environmental reminders.

Type of intervention
Screening.

Economic study type
Cost-effectiveness analysis.

Study population
The study population comprised women unscreened for breast and cervical cancer for at least 3 years, and who had been part of the Northwest Kaiser Permanente (NWKP) managed care organisation for 3 years or more. Women in the mammography trial were aged 40 to 70 years, while women in the Pap smear study were aged 18 to 70 years. Those women with prior histories of breast or cervical cancer, and those who had undergone a bilateral mastectomy or hysterectomy, were excluded from the study.

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

Dates to which data relate
The dates to which the effectiveness and resource use data related were not specified. The price year was 1996.
Source of effectiveness data
The effectiveness data were derived from a single study.

Link between effectiveness and cost data
The costing was undertaken prospectively on the same patient sample as that used in the effectiveness study.

Study sample
No power calculations to determine the sample size were reported, but a sample size of 1,200 women seems to have been planned, whereby these 1,200 would be randomly allocated to one of the four interventions. The Radiology Information Management database identified all mammograms delivered to age-eligible women, and the Pathology database identified all Pap smears.

The initial mammography study search identified 40,079 women, of which 5,285 (13%) were eligible to enter the study. Out of these eligible women, 308 were randomised to the usual care group, 297 to the letter/phone group, 287 to the letter/phone group and 308 to the phone/phone group. For the usual care and letter/letter group, exclusions were based only on invalid addresses. Ten women in the usual care group and 14 in the letter/letter group were excluded before the first intervention, and 4 (usual care) and 24 (letter/letter), respectively, before the second intervention. Of the 595 women queried directly by phone, 183 (96 in the letter/phone group and 87 in the phone/phone group) were not available for scheduling, or had had a mammogram elsewhere within the past 3 years.

The initial Pap smear study search identified 41,683 women, of which 12,856 (23%) were eligible to enter the study. Out of these eligible women, 301 were randomised to the usual care group, 288 to the letter/letter group, 308 to the letter/phone group and 303 to the phone/phone group. For the usual care and letter/letter group, exclusions were based only on invalid addresses. Twenty-one women in the usual care group and 32 in the letter/letter group were excluded before the first intervention, and 16 from the letter/letter group were excluded before the second intervention. Of the 611 women queried directly by phone, 265 (125 in the letter/phone group and 140 in the phone/phone group) were not available for scheduling, or had had a Pap smear elsewhere within the past 3 years.

Study design
The study was a randomised controlled trial that was carried out in a single managed care organisation. The authors did not report the method used to allocate the participants in the trial. The groups were followed up for 12 weeks.

Analysis of effectiveness
The analysis of the clinical study was conducted on both an intention to treat basis and on treatment completers only. The primary outcome used was success or failure in terms of being screened 12 weeks after the first intervention contact. The groups were not shown to be comparable at analysis, as no baseline characteristics were reported. However, the authors did show that the distribution by age of female NWKP members and eligibility to enter into the study was similar.

Effectiveness results
Of all women randomised, the proportion that received a mammogram in the 12 weeks following the intervention was 9% (n=29) for controls, 21% (n=61) for letter/letter, 34% (n=98) for letter/phone and 36% (n=87) for phone/phone. Following the removal of women that phone calls showed to be ineligible for the study, telephone reminder and appointment calls succeeded in bringing in half of the women for screening who were actually targeted and for whom screening was appropriate. All the interventions were more effective than usual care in encouraging mammography. The odds ratio (OR) of being screened using the phone/phone intervention as opposed to usual care was 9.22 (95% confidence interval, CI: 5.79 - 14.68). Similarly, the OR was 9.63 (95% CI: 5.98 - 15.51) using the letter/phone intervention and 2.82 (95% CI: 1.74 - 4.55) using the letter/letter intervention.

Of all women randomised, the proportion that received a Pap smear in the 12 weeks following the intervention was
16% (n=48) for controls, 18% (n=53) for letter/letter, 32% (n=98) for letter/phone and 27% (n=81) for phone/phone. Following the removal of women that phone calls showed to be ineligible for the study, telephone reminder and appointment calls succeeded in bringing in half of the women for screening who were actually targeted and for whom screening was appropriate. With the exception of letter only, all the interventions were more effective than usual care in encouraging a Pap smear. The OR of being screened using the phone/phone intervention as opposed to usual care was 4.77 (95% CI: 3.08 - 7.39). Similarly, the OR was 5.57 (95% CI: 3.64 - 8.53) using the letter/phone intervention and 1.37 (95% CI: 0.89 - 2.12) using the letter/letter intervention.

Clinical conclusions
The authors concluded that reminder letters increased successful screening, while phone contact dramatically enhanced the effectiveness compared with letter only contacts. Phone contacts resulted in the successful screening of about half of those women who were truly in need of screening.

Measure of benefits used in the economic analysis
The measure of benefits used was the number of screenings undertaken.

Direct costs
The direct costs of setting up the outreach-screening programme were included. These included all administration supplies and labour costs related to screening. Since the phone/phone intervention permitted the identification of individuals who should not be screened at the first contact, it was therefore able to reduce the number of second contacts required. Thus, the costs of the second intervention activity were excluded from the analysis for the phone/phone group (n=79 for the mammogram study and 85 for the Pap smear study) if the individual provided information indicating that she did not require a screening test. Also excluded was the cost of the second intervention contact for those individuals (n=41 for the mammogram study and 39 for the Pap smear study) in the two letter intervention groups who responded to the initial letter by notifying the authors that they had already been screened elsewhere. Discounting was unnecessary as all the costs were incurred during a short time, and was thus not performed. The study reported the total costs of each intervention. The price year was 1996.

Statistical analysis of costs
The costs were treated as point estimates (i.e. the data were deterministic).

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

Currency
US dollars ($).

Sensitivity analysis
No sensitivity analysis was performed.

Estimated benefits used in the economic analysis
The incremental number of mammograms produced above usual care, and standardised to identical sample sizes, was 34.26 in the letter/letter group, 76.17 in the letter/phone group and 82.00 in the phone/phone group.

The incremental number of Pap smears produced, and standardised to identical sample sizes, was 7.56 in the letter/letter group, 48.88 in the letter/phone group and 33.22 in the phone/phone group.
Cost results
In the mammography study, the total costs were $4,500 for usual care, $8,456.80 for the letter/letter intervention, $9,493.55 for the letter/phone intervention and $10,307.97 for the phone/phone intervention.

In the Pap smear study, the total costs were $4,500 for usual care, $8,446.71 for the letter/letter intervention, $9,025.51 for the letter/phone intervention and $10,124.05 for the phone/phone intervention.

Synthesis of costs and benefits
The costs and benefits were combined as the cost for each screening (mammogram or Pap smear) above the usual care intervention. Thus, the cost per incremental mammogram was $247 for the letter/letter intervention, $125 for the letter/phone intervention and $126 for the phone/phone intervention.

The cost per incremental Pap smear was $1,117 for the letter/letter intervention, $185 for the letter/phone intervention and $305 for the phone/phone intervention.

Authors' conclusions
A letter reminder, followed by a telephone appointment call, was the most cost-effective approach to screening women who were rarely screened.

CRD COMMENTARY - Selection of comparators
The selection of the comparator was justified since it represented current practice in the authors' setting. You should decide if this is a widely used health intervention in your own setting.

Validity of estimate of measure of effectiveness
The basis of the effectiveness analysis was a randomised controlled trial. This was appropriate for the study questions as well-conducted randomised controlled trials are the 'gold' standard study design when comparing different health technologies. However, confidence in the internal validity of the study would have been enhanced had the authors reported the method used to randomise the women to the four study groups, and the baseline characteristics of the women in each group. Despite this, the study was conducted appropriately, with outcomes being analysed both on an intention to treat and a treatment completers only basis. Further, appropriate OR were calculated and presented with the 95% CIs.

Validity of estimate of measure of benefit
The estimation of benefits was obtained directly from the effectiveness analysis.

Validity of estimate of costs
The relevant costs from the perspective of a Health Management Organisation were included. The costs and the quantities were not reported separately, which will hamper the generalisability of the authors' results. The costs were derived from the authors' setting. However, a statistical analysis of the costs was not performed, hence introducing uncertainty into the reliability of the authors' results. Discounting was unnecessary since all the costs were incurred during a short time. The authors satisfactorily reported the date to which the prices related, which will ease any future inflation exercises.

Other issues
The authors made appropriate comparisons of their findings with those from other studies that also found mail and telephone reminders to be a cost-effective means of improving screening. As one of the limitations of their study, the authors reported that their findings were derived from a single large health care system. Hence, the results may not be generalisable to other settings. However, the authors also pointed out that patterns of care delivery and limitations on
data on hysterectomy would appear to be similar in other settings. The authors do not appear to have presented their results selectively and their conclusions reflected the scope of the analysis. The authors reported no further limitations to their study, although it would appear that their cost-effectiveness calculations were flawed because they did not include the costs of the usual care intervention in the incremental analysis. Hence, it would appear that the cost-effectiveness of the three study interventions has been underestimated.

**Implications of the study**
The authors recommended that screening strategies focus more on those who are rarely or never screened. In particular, the authors noted that outreach efforts should focus on women who are in both mammogram and Pap smear safety nets, as these women are likely to be at high risk for other reasons in addition to their failure to be screened.

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